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THE DANISH "DANA"-EXPEDITIONS 1920—22
IN THE NORTH ATLANTIC AND THE GULF OF PANAMA

LEADER: PROFESSOR *JOHS. SCHMIDT*, PH. D., D. SC.

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No. 6

THE FISHES
OF
THE FAMILIES STOMIATIDAE AND MALACOSTEIDAE

BY

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WITH 14 PLATES AND 138 FIGURES IN THE TEXT

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1. INTRODUCTION

The fishes sent to us for investigation belong to four closely related families, Astronesthidae, Chauliodontidae, Stomiatidae and Malacosteidae. Our report on the first two of these has already been published, and we now present a report on the last two families, of which we have made a complete systematic revision, except for the omission of the genus *Stomias*, the specimens of which are being studied by Mr. Ege. This is based on the "Dana" collection and on the specimens in the British Museum (Natural History), but we have also examined several of Zugmayer's types, for the loan of which we have to thank Professors Roule (Paris) and Richard (Monaco). In addition one of us has examined, in Berlin, the types of several species described by Brauer and by Pappenheim.

The "Dana" collection is a very large one; in our former report we described four new genera and seventeen news species of Astronesthidae and a new *Chauliodus*. Below we describe four new genera, twelve new subgenera, and seventy-three new species of Stomiatidae, and four new species of Malacosteidae, the new species exceeding in number those previously known (77 to 59).

The Stomiatidae and Malacosteidae are oceanic fishes, soft-rayed, with pectoral fins placed low, pelvics abdominal in position, dorsal and anal posterior, generally opposed and subequal, although in one genus (*Idiacanthus*) the dorsal extends forward and in three the anal fin is the longer, and with a rather small caudal. Some species with high dorsal and anal fins just in front of the small caudal recall the Crossopterygian Coelacanthidae. The mouth has a lateral cleft and the maxillary enters the gape; the teeth are acute and unequal. A hyoid barbel is generally present. There are generally two series of photophores on each side of the lower part of the body and a single series on the tail. Behind the eye is a larger organ with luminous surface that can be turned downwards and inwards into a pocket, and so be concealed.

These fishes are probably fairly active and predacious. It is possible that the serial photophores may serve as recognition marks, enabling the members of a shoal to keep in touch with each other, and from its position it may be presumed that the postocular luminous organ may give light for vision. The use of the barbel is problematical; when one is present in bottom-living fishes it is used to probe for food on the ground; in these fishes of the upper and middle layers of the ocean such a function is out of the question, but the barbel may be sensory, perhaps receiving impressions that indicate the approach of other fishes; when very long and simple, as in *Lamprotoxus* and *Bathophilus*, it may even be tactile; often it has a bulb and sometimes other swellings, and histological examination shows that these are glandular, similar in structure to the luminous organs of the body; presumably these swollen bodies are luminous, and a barbel possessing them may act as a lure.

Like most other piscivorous oceanic fishes that live below the surface the Stomiatidae and Malacosteidae have the stomach very distensible, and they are able to swallow fishes larger than themselves. The "Dana" Collection includes several specimens of different genera distended by larger fishes, generally Myctophidae.

The genera of Stomiatidae are distinguished externally mainly by the structure and position of the fins, the form of the mouth, and the structure and arrangement of the teeth. In the distinction of species form and proportions, and the number of photophores and of fin-rays, are always important, but it often happens that there is no difference in these respects between a number of related species. In some genera (e. g. *Leptostomias, Melanostomias*) the species scarcely differ except in the structure of the barbel, and this is particularly true of the subgenera of the large genus *Eustomias,* for in most of these the species agree in form and proportions, number of fin-rays and of photophores, etc., and appear to differ only in the structure of the barbel, which shows remarkable modifications in this genus. In other genera (e. g. *Bathophilus*) the barbel is similar in all the species, which differ from each other considerably in form and in the number of rays in the paired fins. As these fishes are remote from observation when living, it is unlikely that we shall ever understand the meaning of their specific features, or of the dissimilar lines of specific differentiation in the different genera.

Nevertheless the Stomiatidae are interesting as material for a morphological study, exhibiting remarkable divergences from a common plan; we mention especially the extraordinary modification of the anterior vertebrae in *Leptostomias, Thysanactis,* and *Eustomias.* The Malacosteidae are very specialised and among the strangest fishes known to science.

The "Dana" material includes some series illustrating changes during growth. It is a general rule that the barbel increases in relative length as the fish grows, but in some species of *Aristostomias* it appears also to change its structure rather abruptly in the young fish, specimens, apparently of the same species, occurring of the same size, but with different barbels. The changes in the structure of the barbel and the relative size of the postocular luminous organ during the growth of *Echiostoma tanneri* are well shown by the "Dana" specimens, also the relative increase in size, during growth, of the eye and postocular organ in *Photostomias guernei,* especially in males. In both *Eustomias* and *Idiacanthus* young specimens differ considerably from the adults, and as in *Aristostomias* there may be in the same species examples with juvenile characters as large as or even larger than those with the structure of adults, indicating that there is a rapid transition from one stage to the other, possibly accompanied by a decrease in size.

Several species are so well represented in the "Dana" collection that we have ventured to make some observations on their distribution in the North Atlantic.

2. LIST OF GENERA AND SPECIES OF STOMIATIDAE (EXCEPT *STOMIAS*) AND MALACOSTEIDAE

FAMILY STOMIATIDAE

1. *Chirostomias* gen. n.
   1. *pliopterus* sp. n.
2. *Trigonolampa,* gen. n.
   1. *miriceps,* sp. n.
3. *Opostomias,* Günther.
   1. *micripnus,* Günther.
4. *Flagellostomias,* Parr.
   1. *boureei,* Zugmayer.
5. *Thysanactis,* gen. n.
   1. *dentex,* sp. n.
6. *Leptostomias,* Gilbert.
   1. *haplocaulus,* sp. n.
   2. *gracilis,* sp. n.
   3. *longibarba,* sp. n.
   4. *macronema,* Gilbert.
   5. *leptobolus,* sp. n.
   6. *analis,* sp. n.
   7. *problematicus,* Parr.
   8. *gladiator,* Zugmayer.
   9. *ramosus,* sp. n.

7. *Grammatostomias*, Goode & Bean.
   1. *dentatus*, Goode & Bean.
8. *Lamprotoxus*, Holt & Byrne.
   1. *flagellibarba*, Holt & Byrne.
   2. *paucifilis*, sp. n.
   3. *phanobrochus*, sp. n.
9. *Bathophilus*, Giglioli.
   1. *brevis*, sp. n.
   2. *nigerrimus*, Giglioli.
   3. *proximus*, sp. n.
   4. *longipes*, sp. n.
   5. *schizochirus*, sp. n.
   6. *digitatus*, Welsh.
   7. *metallicus*, Welsh.
   8. *longipinnis*, Pappenheim.
   9. *ater*, A. Brauer.
   10. *indicus*, A. Brauer.
   11. *pawneei*, Parr.
   12. *melas*, sp. n.
   13. *chironema*, sp. n.
   14. *filifer*, Garman.
10. *Pachystomias*, Günther.
   1. *microdon*, Günther.
   2. *atlanticus*, sp. n.
11. *Eustomias*, Vaillant.
   (*Spilostomias*, subgen. n.)
   1. *braueri*, Zugmayer.
   2. *stigmatopleura*, sp. n.
   (*Urostomias*, subgen. n.)
   3. *macrurus*, sp. n.
   (*Haploclonus*, subgen. n.)
   4. *brevifilis*, sp. n.
   5. *enbarbatus*, Welsh.
   6. *acinosus*, sp. n.
   7. *barbuva*, sp. n.
   8. *botrypogon*, sp. n.
   (*Eustomias*, Vaillant.)
   9. *obscurus*, Vaillant.
   (*Nominostomias*, subgen. n.)
   10. *bibulbosus*, Parr.
   11. *bituberatus*, sp. n.
   12. *micraster*, Parr.
   13. *bimargaritatus*, sp. n.
   14. *arborifer*, Parr.
   15. *melanostigma*, sp. n.
   16. *melanonema*, sp. n.
   17. *patulus*, sp. n.
   18. *longibarba*, Parr.
   19. *simplex*, sp. n.
   20. *dubius*, Parr.
   21. *polyaster*, Parr.
   22. *variabilis*, sp. n.
   23. *trituberatus*, sp. n.
   24. *brevibarbatus*, Parr.
   25. *xenobolus*, sp. n.
   26. *pyrifer*, sp. n.
   27. *globulifer*, sp. n.
   28. *macrophthalmus*, Parr.
   29. *leptobolus*, sp. n.
   (*Rhynchostomias*, subgen. n.)
   30. *parri*, sp. n.
   (*Achirostomias*, subgen. n.)
   31. *dactylobolus*, sp. n.
   32. *lipochirus*, sp. n.
   33. *melanobolus*, sp. n.
   (*Triclonostomias*, subgen. n.)
   34. *drechseli*, sp. n.
   35. *furcifer*, sp. n.
   36. *tenisoni*, sp. n.
   (*Dinematochirus*, subgen. n.)
   37. *parvibulbus*, Parr.
   38. *bigelowi*, Welsh.
   39. *triramis*, sp. n.
   40. *paucifilis*, Parr.
   41. *silvescens*, sp. n.
   42. *schmidti*, sp. n.
   43. *macronema*, sp. n.
   44. *frondosus*, sp. n.
   45. *binghami*, Parr.
   46. *fissibarbis*, Pappenheim.
   47. *dendriticus*, sp. n.
   48. *monoclonus*, sp. n.
   (*Neostomias*, Gilchrist.)
   49. *tetranema*, Zugmayer.
   50. *ramulosus*, sp. n.
   51. *monodactylus*, sp. n.
   52. *filifer*, Gilchrist.
12. *Haplostomias*, gen. n.
   1. *tentaculatus*, sp. n.
   2. *bituberatus*, sp. n.
13. *Melanostomias*, A. Brauer.
   1. *niger*, Gilchrist & von Bonde.
   2. *spilorhynchus*, sp. n.
   3. *valdiviae*, A. Brauer.

4. *melanocaulus*, sp. n.
5. *heteropogon*, sp. n.
6. *biseriatus*, sp. n.
7. *albibarba*, sp. n.
8. *melanops*, A. Brauer.
9. *margaritifer*, sp. n.
10. *melanopogon*, sp. n.
11. *macrophotus*, sp. n.

14. *Echiostoma*, Lowe.
1. *barbatum*, Lowe.
2. *guentheri*, sp. n.
3. *ctenobarba*, Parr.
4. *tanneri*, Gill.

15. *Photonectes*, Günther.
(*Melanonectes*, subgen. n.)
1. *dinema*, sp. n.
2. *leucospilus*, sp. n.
3. *ovibarba*, sp. n.
4. *braueri*, Zugmayer.
(*Photonectes*, Günther).
5. *achirus*, sp. n.
6. *cærulescens*, sp. n.
7. *phyllopogon*, sp. n.
8. *mirabilis*, Parr.
9. *albipinnis*, Döderlein.
(*Dolichostomias*, Parr.)
10. *gracilis*, Goode & Bean.
(*Microchirichthys*, subgen. n.)
11. *parvimanus*, sp. n.
12. *fimbria*, sp. n.
(*Trachinostomias*, Parr).
13. *intermedius*, Parr.
14. *richardi*, Zugmayer.
15. *margarita*, Goode & Bean.
16. *monodactylus*, sp. n.
17. *flagellatus*, Parr.

16. *Idiacanthus*, Peters.
1. *niger*, Regan.
2. *fasciola*, Peters.
3. *panamensis*, sp. n.
4. *atlanticus*, Brauer.
5. *antrostomus*, Gilbert.

FAMILY MALACOSTEIDAE

1. *Photostomias*, Collett.
1. *guernei*, Collett.
2. *atrox*, Alcock.

2. *Aristostomias*, Zugmayer.
1. *lunifer*, sp. n.
2. *scintillans*, Gilbert.
3. *xenostoma*, sp. n.
4. *tittmanni*, Welsh.
5. *grimaldii*, Zugmayer.
6. *polydactylus*, sp. n.

3. *Malacosteus*, Ayres.
1. *niger*, Ayres.
2. *danae*, sp. n.
3. *indicus*, Günther.

3. STATIONS AT WHICH STOMIATIDAE AND MALACOSTEIDAE WERE TAKEN, WITH LIST OF SPECIMENS

St. 38. ("Thor" 1906) Bay of Biscay (43° 52′ N. 2° 27′ W.)
250 M.W. ..... 1 *Chirostomias pliopterus* (115 mm.).

St. 45. ("Thor" 1909) Mediterranean (37° 28′ N. 8° 8′ E.).
300 M.W. ..... 1 *Bathophilus nigerrimus* (49 mm.).

St. 52. ("Thor" 1906) Atlantic, S. of Ireland (48° 42′ N. 12° 20′ W.).
1860 M.W. ..... 1 *Trigonolampa miriceps* (105 mm.).

St. 65. ("Thor" 1909) Atlantic. (35° 53′ N. 7° 26′ W.).
1600 M.W. ..... 1 *Photostomias guernei* (81 mm.).
1 *Idiacanthus fasciola* (263 mm).

St. 91. ("Thor" 1910) Atlantic (35° 53′ N. 7° 26 W.).
1600 M.W. ..... 1 *Malacosteus niger* (44 mm.).
1 *Flagellostomias boureei* (70 mm.).

St. 156. ("Thor" 1910). Mediterranean (32° 16′ N. 26° 03′ E.).
1000 M.W. ..... 1 *Bathophilus nigerrimus* (59 mm.).
St. 399. ("Ingolf" 1911). Atlantic. (34° 23′ N. 15° 31′ W.).
56 M.W. ..... 1 *Eustomias obscurus* (70 mm).
St. 442. ("Ingolf" 1912). Atlantic (20° 16′ N. 16° 48′ W.).
95 M.W. ..... 1 *Idiacanthus fasciola* (63 mm.).
St. 446. ("Ingolf" 1912). Atlantic (30° 10′ N. 45° 41′ W.).
95 M.W. ..... 1 *Eustomias obscurus* (78 mm.).
St. 662. ("Texas" 1912). Atlantic (24° 30′ N. 20° 31′ W.).
188 M.W. ..... 1 *Eustomias obscurus* 98 mm.).
St. 678. ("Nord Coerr" 1912). Atlantic (26° 08′ N. 57° 20′ W.).
178 M.W. ..... 1 *Idiacanthus fasciola* (75 mm.).
St. 713. ("Pennsylvania" 1913). Atlantic (38° 44′ N. 69° 03′ W.).
141 M.W. ..... 1 *Photostomias guernei* (45 mm.).
St. 721. ("Texas" 1913). Atlantic (25° 19′ N. 19° 08′ W.).
122 M.W. ..... 2 *Eustomias obscurus* (104, 112 mm.).
St. 774. ("Bintang" 1914). Atlantic (30° 25′ N. 50° 15′ W.).
150 M.W. ..... 1 *Eustomias obscurus* (100 mm.).
St. 812. ("Bintang" 1915). Atlantic (29° 20′ N. 40° 23′ W.).
1 *Eustomias* sp. (36 mm.).
St. 813. ("Bintang" 1915). Atlantic (24° 00′ N. 52° 30′ W.).
1 *Eustomias obscurus* (88 mm.).
1 *Idiacanthus fasciola* (125 mm.).
St. 817. ("Tranquebar" 1915). Atlantic (21° 40′ N. 52° 32′ W.).
170 M.W. ..... 1 *Idiacanthus fasciola* (50 mm.).
St. 823. Atlantic (35° 35′ N. 8° 50′ W.).
150 M.W. ..... 4 *Bathophilus metallicus* (40—80 mm.).
St. 827. Atlantic (29° 30′ N. 16° 15′ W.).
300 M.W. ..... 1 *Bathophilus metallicus* (30 mm.).
St. 828. Atlantic (27° 54′ N. 16° 35′ W.).
300 M.W. ..... 2 *Bathophilus metallicus* (33, 34 mm.).
St. 829. Atlantic (25° 07′ N. 19° 20′ W.).
300 M.W. ..... 1 *Leptostomias ramosus* (76 mm.).
St. 830. Atlantic (24° 44′ N. 22° 32′ W.).
50 M.W. ..... 4 *Bathophilus metallicus* (35—110 mm.).
1 *Eustomias obscurus* (172 mm.).
100 M.W. ..... 3 *Idiacanthus fasciola* (53—252 mm.).
1 *Leptostomias longibarba* (115 mm.).
300 M.W. ..... 1 *Idiacanthus fasciola* (185 mm.).
2 *Photostomia guernei* (32 mm.).
St. 831. Atlantic (24° 34′ N. 28° 04′ W.).
100 M.W. ..... 1 *Eustomias fissibarbis* (65 mm.).
2 *Photonectes ovibarba* (28, 30 mm.).
St. 832. Atlantic (24° 10′ N. 33° 11′ W.).
50 M.W. ..... 2 *Idiacanthus fasciola* (74, 202 mm.).
1 *Photostomias guernei* (50 mm.).
100 M.W. ..... 1 *Idiacanthus fasciola* (210 mm.).

St. 834. Atlantic (24° 20′ N. 35° 31′ W.).
300 M.W. ..... 1 *Eustomias stigmatopleura* (58 mm.).
St. 835. Atlantic (24° 44′ N. 36° 58′ W.).
100 M.W. ..... 1 *Bathophilus metallicus* (48 mm.).
St. 837. Atlantic (23° 40′ N. 43° 26′ W.).
200 M.W. ..... 1 *Bathophilus chironema* (41 mm.).
1 *Idiacanthus fasciola* (110 mm).
300 M.W. ..... 1 *Eustomias fissibarbis* (81 mm.).
1 *Photonectes ovibarba* (28 mm.).
St. 844. Atlantic (25° 49′ N. 51° 55′ W.).
150 M.W. ..... 1 *Eustomias obscurus* (67 mm.).
200 M.W. ..... 1 *Lamprotoxus paucifilis* (40 mm.).
St. 849. Atlantic, E. of Virgin Islands (19° 00′ N. 63° 53′ W.).
300 M.W. ..... 1 *Bathophilus pawneei* (30 mm.).
St. 855. Atlantic (29° 15′ N. 59 °45′ W.).
150 M.W. ..... 1 *Leptostomias ramosus* (71 mm.).
1 *Eustomias obscurus* (79 mm.).
1 *Echiostoma tanneri* (133 mm,).
200 M.W. ..... 1 *Photonectes dinema* (26 mm.).
1 *Photonectes parvimanus* (26 mm.).
1 *Idiacanthus fasciola* (63 mm.).
300 M.W. ..... 1 *Photostomias guernei* (30 mm.).
500 M.W. ..... 1 — — (31 mm.).
St. 856. Atlantic (30° 47′ N. 60° 43′ W.).
50 M.W. ..... 1 *Idiacanthus fasciola* (100 mm.).
100 M.W. ..... 1 *Eustomias obscurus* (67 mm.).
150 M.W. ..... 1 *Photostomias guernei* (35 mm.).
St. 857. Atlantic (30° 47′ N. 62° 27′ W.).
150 M.W. ..... 1 *Bathophilus metallicus* (30 mm.).
St. 858. Atlantic (29° 31′ N. 64° 00′ W.).
100 M.W. ..... 1 *Echiostoma tanneri* (77 mm.).
150 M.W. ..... 1 *Bathophilus metallicus* (50 mm.).
200 M.W. ..... 1 *Eustomias obscurus* (147 mm.).
1 *Haplostomias tentaculatus* (89 mm.).
300 M.W. ..... 1 *Idiacanthus fasciola* (196 mm.).
St. 859. Atlantic (29° 02′ N. 65° 09′ W.).
150 M.W. ..... 1 *Photostomias guernei* (35 mm.).
St. 861. Atlantic, S. of Bermuda (32° 30′ N. 64° 24′ W.).
150 M.W. ..... 1 *Photostomias guernei* (36 mm.).
St. 863. Atlantic (30° 43′ N. 60° 46′ W.).
50 M.W. ..... 1 *Eustomias obscurus* (125 mm.).
150 M.W. ..... 1 *Photonectes intermedius* (63 mm.).
1 *Idiacanthus fasciola* (175 mm.).
St. 864. Atlantic (30° 02′ N. 59° 10′ W.).
150 M.W. ..... 2 *Photostomias guernei* (26, 37 mm.).
St. 865. Atlantic (29° 19′ N. 57° 43′ W.).
150 M.W. ..... 1 *Eustomias obscurus* (72 mm.).
2 *Idiacanthus fasciola* (120, 165 mm.).

St. 865. Atlantic (29° 19′ N. 57° 43′ W.).
200 M.W. ..... 1 *Leptostomias ramosus* (68 mm.).
2 *Eustomias obscurus* (70, 73 mm.).
St. 871. Atlantic (27° 15′ N. 61° 35′ W.).
100 M.W. ..... 2 *Eustomias obscurus* (69, 113 mm.).
200 M.W. ..... 1 — — (85 mm.).
St. 877. Atlantic, near Bermuda (32° 37′ N. 63° 28′ W.).
100 M.W. ..... 1 *Bathophilus metallicus* (33 mm.).
150 M.W. ..... 1 *Echiostoma tanneri* (75 mm.).
St. 878. Atlantic, E. of Bermuda (33° 24′ N. 61° 05′ W.).
150 M.W. ..... 1 *Bathophilus metallicus* (35 mm.).
1 *Photonectes intermedius* (65 mm.).
St. 881. Atlantic (34° 42′ N. 54° 00′ W.).
150 M.W. ..... 1 *Aristostomias tittmanni* (53 mm.).
St. 882. Atlantic (33° 00′ N. 54° 02′ W.).
100 M.W. ..... 1 *Bathophilus metallicus* (30 mm.).
150 M.W. ..... 2 — — (25, 35 mm.).
1 *Aristostomias grimaldii* (45 mm.).
St. 883. Atlantic (30° 53′ N. 54° 07′ W.).
100 M.W. ..... 1 *Photonectes parvimanus* (33 mm.).
150 M.W. ..... 1 — — (35 mm.).
1 *Bathophilus brevis* (15 mm.).
2 *Idiacanthus fasciola* (63, 166 mm.).
1 *Eustomias obscurus* (145 mm.).
1 *Photostomias guernei* (40 mm.).
St. 884. Atlantic (28° 49′ N. 54° 10′ W.).
150 M.W. ..... 1 *Bathophilus nigerrimus* (19 mm.).
1 *Photostomias guernei* (40 mm.).
St. 885. Atlantic (26° 46′ N. 54° 14′ W.).
150 M.W. ..... 3 *Idiacanthus fasciola* (58—88 mm.).
St. 886. Atlantic (24° 40′ N. 54° 19′ W.).
150 M.W. ..... 1 *Eustomias obscurus* (90 mm.).
3 *Idiacanthus fasciola* (80—183 mm.).
St. 888. Atlantic (27° 31′ N. 61° 32′ W.).
100 M.W. ..... 1 *Idiacanthus fasciola* (83 mm.).
1 *Eustomias obscurus* (62 mm.).
150 M.W. ..... 1 — — (77 mm.).
St. 889. Atlantic (28° 20′ N. 63° 50′ W.).
50 M.W. ..... 1 *Eustomias obscurus* (70 mm.).
100 M.W. ..... 3 — — (70—75 mm.).
150 M.W. ..... 1 — — (79 mm.).
1 *Idiacanthus fasciola* (85 mm.).
St. 890. Atlantic (28° 44′ N. 66° 04′ W.).
100 M.W. ..... 1 *Eustomias obscurus* (95 mm.).
St. 891. Atlantic (29° 28′ N. 69° 25′ W.).
200 M.W. ..... 1 *Photonectes parvimanus* (41 mm.).
St. 895. Atlantic (39° 20′ N. 65° 55′ W.).
100 M.W. ..... 1 *Idiacanthus fasciola* (65 mm.).

St. 897. Atlantic (40° 07′ N. 51° 02′ W.).
100 M.W. ..... 1 *Bathophilus metallicus* (31 mm.).
1 *Idiacanthus fasciola* (137 mm.).
St. 904. Atlantic (22° 31′ N. 62° 07′ W.).
150 M.W. ..... 1 *Eustomias bimargaritatus* (75 mm.).
200 M.W. ..... 1 *Bathophilus longipinnis* (27 mm.).
1 *Idiacanthus fasciola* (99 mm.).
St. 905. Atlantic (24° 27′ N. 61° 32′ W.).
150 M.W. ..... 1 *Eustomias obscurus* (72 mm.).
St. 907. Atlantic (27° 24′ N. 60° 09′ W.).
200 M.W. ..... 1 *Eustomias obscurus* (180 mm.).
1 *Idiacanthus fasciola* (146 mm.).
St. 908. Atlantic (28° 20′ N. 59° 16′ W.).
200 M.W. ..... 1 *Idiacanthus fasciola* (68 mm.).
St. 910. Atlantic (27° 43′ N. 57° 22′ W.).
200 M.W. ..... 1 *Bathophilus metallicus* (37 mm.).
St. 911. Atlantic (26° 34′ N. 57° 02′ W.).
200 M.W. ..... 2 *Idiacanthus fasciola* (128, 148 mm.).
St. 912. Atlantic (25° 01′ N. 56° 21′ W.).
50 M.W. ..... 1 *Eustomias macrurus* (108 mm.).
St. 913. Atlantic (23° 37′ N. 55° 45′ W.).
100 M.W. ..... 1 *Idiacanthus fasciola* (142 mm.).
200 M.W. ..... 2 *Bathophilus pawneei* (26, 33 mm.).
1 *Echiostoma tanneri* (152 mm.).
St. 923. Atlantic (22° 47′ N. 48° 53′ W.).
500 M.W. ..... 1 *Bathophilus pawneei* (20 mm.).
St. 924. Atlantic (22° 12′ N. 40° 00′ W.).
300 M.W. ..... 2 *Eustomias bimargaritatus* (70, 72 mm.).
St. 925. Atlantic (21° 27′ N. 46° 52′ W.).
200 M.W. ..... 1 *Eustomias obscurus* (67 mm.).
1 *Bathophilus metallicus* (30 mm.).
1 — *pawneei* (30 mm.).
300 M.W. ..... 1 *Lamprotoxus phanobrochus* (43 mm.).
St. 926. Atlantic (21° 15′ N. 46° 10′ W.).
200 M.W. ..... 1 *Idiacanthus fasciola* (50 mm.).
St. 927. Atlantic (20° 32′ N. 45° 02′ W.).
10 M.W. ..... 1 *Idiacanthus fasciola* (53 mm.).
50 M.W. ..... 1 *Photostomias guernei* (60 mm.).
1 *Aristostomias polydactylus* (60 mm.).
150 M.W. ..... 1 — — (35 mm.).
1 *Bathophilus pawneei* (38 mm.).
200 M.W. ..... 1 — — (32 mm.).
1 *Idiacanthus fasciola* (76 mm.).
1 *Photostomias guernei* (41 mm.).
300 M.W. ..... 2 *Bathophilus pawneei* (20, 22 mm.).
St. 928. Atlantic (22° 43′ N. 45° 18′ W.).
50 M.W. ..... 1 *Aristostomias polydactylus* (35 mm.).
100 M.W. ..... 2 *Idiacanthus fasciola* (50, 141 mm.).

St. 928. Atlantic (22° 43′ N. 45° 18′ W.).
200 M.W. — 1 *Idiacanthus fasciola* (120 mm.).
1 *Eustomias frondosus* (59 mm.).
300 M.W. — 1 *Chirostomias pliopterus* (90 mm.).
St. 929. Atlantic (24° 10′ N. 45° 33′ W.).
50 M.W. — 1 *Idiacanthus fasciola* (60 mm.).
150 M.W. — 2 *Bathophilus pawneei* (27, 33 mm.).
300 M.W. — 1 *Idiacanthus fasciola* (54 mm.).
St. 932. Atlantic (27° 23′ N. 46° 24′ W.).
300 M.W. — 1 *Eustomias stigmatopleura* (62 mm.).
1 — *obscurus* (64 mm.).
1 *Photostomias guernei* (55 mm.).
St. 933. Atlantic (27° 40′ N. 48° 40′ W.).
200 M.W. — 1 *Photostomias guernei* (38 mm.).
St. 934. Atlantic (27° 00′ N. 49° 50′ W.).
200 M.W. — 1 *Echiostoma tanneri* (142 mm.).
1 *Idiacanthus fasciola* (112 mm.).
300 M.W. — 1 — — (57 mm.).
St. 935. Atlantic (24° 44′ N. 51° 25′ W.).
200 M.W. — 1 *Bathophilus longipinnis* (27 mm.).
St. 937. Atlantic (27° 04′ N. 53° 27′ W.).
300 M.W. — 1 *Idiacanthus fasciola* (58 mm.).
St. 939. Atlantic (26° 10′ N. 56° 30′ W.).
500 M.W. — 1 *Photostomias guernei* (78 mm.).
St. 941. Atlantic (27° 31′ N. 59° 52′ W.).
1000 M.W. — 1 *Eustomias bituberatus* (82 mm.).
St. 945. Atlantic (25° 00′ N. 64° 10′ W.).
400 M.W. — 1 *Eustomias frondosus* (52 mm.).
St. 946. Atlantic (24° 20′ N. 65° 30′ W.).
200 M.W. — 1 *Eustomias obscurus* (69 mm.).
400 M.W. — 1 *Photostomias guernei* (42 mm.).
St. 947. Atlantic (23° 10′ N. 66° 15′ W.).
200 M.W. — 2 *Idiacanthus fasciola* (83, 112 mm.).
400 M.W. — 2 *Photostomias guernei* (90, 105 mm.).
900 M.W. — 1 *Melanostomias bimargaritatus.*
St. 948. Atlantic (22° 14′ N. 67° 22′ W.).
100 M.W. — 1 *Eustomias bimargaritatus* (88 mm.).
200 M.W. — 2 *Idiacanthus fasciola* (70, 175 mm.).
400 M.W. — 1 — — (110 mm.).
St. 949. Atlantic (21° 40′ N. 66° 55′ W.).
100 M.W. — 2 *Idiacanthus fasciola* (70, 80 mm.).
300 M.W. — 1 — — (46 mm.).
St. 950. Atlantic (20° 50′ N. 66° 30′ W.).
200 M.W. — 1 *Eustomias bimargaritatus* (87 mm.).
1 *Melanostomias margaritifer* (80 mm.).
1 *Photostomias guernei* (45 mm.).
300 M.W. — 1 *Idiacanthus fasciola* (82 mm.).

St. 950. Atlantic (20° 50′ N. 66° 30′ W.).
400 M.W. — 1 *Bathophilus longipes* (50 mm.).
1 *Eustomias obscurus* (58 mm.).

St. 951. Atlantic (20° 20′ N. 65° 20′ W.).
400 M.W. — 2 *Idiacanthus fasciola* (47, 60 mm.).

St. 952. Caribbean Sea, S. of Virgin Islands (17° 55′ N. 64° 48′ W.).
50 M.W. — 3 *Idiacanthus fasciola* (68—90 mm.).
300 M.W. — 1 *Eustomias obscurus* (63 mm.).
400 M.W. — 1 *Melanostomias macrophotus* (20 mm.).

St. 1006. Atlantic (50° 21′ N. 26° 55′ W.).
3000 M.W. — 1 *Idiacanthus fasciola* (44 mm.).

St. 1011. Atlantic (42° 38′ N. 30° 42′ W.).
65 M.W. — 1 *Bathophilus metallicus* (42 mm.).

St. 1015. Atlantic (31° 38′ N. 33° 06′ W.).
1000 M.W. — 1 *Bathophilus metallicus* (34 mm.).

St. 1016. Atlantic (29° 54′ N. 35° 28′ W.).
65 M.W. — 1 *Bathophilus longipinnis* (28 mm.).

St. 1017. Atlantic (28° 00′ N. 37° 57′ W.).
150 M.W. — 1 *Eustomias obscurus* (62 mm.).

St. 1018. Atlantic (28° 37′ N. 39° 36′ W.).
150 M.W. — 1 *Photonectes parvimanus* (33 mm.).
1 *Idiacanthus fasciola* (45 mm.).

St. 1019. Atlantic (31° 06′ N. 41° 45′ W.).
65 M.W. — 1 *Eustomias obscurus* (63 mm.).
150 M.W. — 1 *Leptostomias ramosus* (71 mm.).
1 *Eustomias schmidti* (70 mm.).
3 *Idiacanthus fasciola* (80—225 mm.).
300 M.W. — 1 *Leptostomias ramosus* (58 mm.).
1 *Lamprotoxus paucifilis* (26 mm.).
1 *Melanostomias spilorhynchus* (30 mm.).
1 *Photostomias guernei* (73 mm.).
600 M.W. — 1 *Photonectes parvimanus* (29 mm.).

St. 1020. Atlantic (35° 50′ N. 44° 55′ W.).
65 M.W. — 1 *Bathophilus nigerrimus* (15 mm.).
150 M.W. — 2 *Melanostomias spilorhynchus* (25, 27 mm.).

St. 1027. Atlantic (39° 56′ N. 52° 17′ W.).
80 M.W. — 2 *Melanostomias spilorhynchus* (30, 40 mm.).

St. 1028. Atlantic (37° 46′ N. 56° 11′ W.).
80 M.W. — 8 *Melanostomias spilorhynchus* (25—31 mm.).

St. 1030. Atlantic (35° 31′ N. 55° 58′ W.).
150 M.W. — 1 *Eustomias acinosus* (114 mm.).
1 — *barbuva* (109 mm.).
300 M.W. — 1 *Photostomias guernei* (88 mm.).

St. 1031. Atlantic (33° 18′ N. 56° 03′ W.).
65 M.W. — 1 *Eustomias obscurus* (90 mm.).
80 M.W. — 3 *Melanostomias biseriatus* (20—25 mm.).
5 — *spilorhynchus* (23—27 mm.).

St. 1031. Atlantic (33° 18′ N. 56° 03′ W.).

80 M.W.	1	*Photonectes intermedius* (21 mm.).
	1	*Idiacanthus fasciola* (150 mm.).
	1	*Eustomias macrurus* (80 mm.).
	1	*Photostomias guernei* (64 mm.).
150 M.W.	1	*Chirostomias pliopterus* (98 mm.).
	1	*Bathophilus metallicus* (27 mm.).
	1	*Melanostomias biseriatus* (22 mm.).
	1	*Photonectes dinema* (29 mm.).
	1	— *intermedius* (20 mm.).
600 M.W.	1	*Photostomias guernei* (68 mm.).

St. 1032. Atlantic (31° 39′ N. 53° 23′ W.).

25 M.W.	1	*Eustomias obscurus* (94 mm.).
65 M.W.	1	— — (66 mm.).
100 M.W.	1	— — (75 mm.).
150 M.W.	1	*Leptostomias ramosus* (56 mm.).

St. 1033. Atlantic (29° 52′ N. 53° 03′ W.).

65 M.W.	4	*Eustomias obscurus.*
	3	*Melanostomias spilorhynchus* (30—34 mm.).
	1	*Idiacanthus fasciola* (68 mm.).
80 M.W.	3	— — (50—225 mm.).

St. 1034. Atlantic (28° 21′ N. 52° 40′ W.).

65 M.W.	1	*Melanostomias spilorhynchus* (32 mm.).
80 M.W.	1	*Eustomias obscurus* (80 mm.).

St. 1035.

65 M.W.	2	*Eustomias obscurus* (75, 88 mm.).

St. 1040. Atlantic (28° 06′ N. 55° 16′ W.).

65 M.W.	1	*Eustomias obscurus* (92 mm.).
110 M.W.	1	*Bathophilus nigerrimus* (18 mm.).

St. 1041. Atlantic (29° 43′ N. 37° 28′ W.).

150 M.W.	1	*Bathophilus chironema* (29 mm.).

St. 1042. Atlantic (30° 55′ N. 58° 48′ W.).

25 M.W.	1	*Eustomias obscurus* (25 mm.).
80 M.W.	3	*Idiacanthus fasciola* (68—178 mm.).

St. 1043. Atlantic (31° 59′ N. 59° 52′ W.).

80 M.W.	1	*Eustomias obscurus* (207 mm.).
110 M.W.	2	*Melanostomias spilorhynchus* (32, 33 mm.).
	1	*Eustomias fissibarbis* (50 mm.).
	1	— *longibarba* (61 mm.).
150 M.W.	1	— *simplex* (71 mm.).
	1	*Melanostomias spilorhynchus* (28 mm.).
	1	*Photonectes intermedius* (86 mm.).
	1	*Idiacanthus fasciola* (97 mm.).
	1	*Photostomias guernei* (35 mm.).

St. 1044. Atlantic (32° 14′ N. 63° 51′ W.).

110 M.W.	1	*Bathophilus metallicus* (35—60 mm.).
	2	*Melanostomias spilorhynchus* (35, 40 mm.).

St. 1044. Atlantic (32° 14′ N. 63° 51′ W.).
110 M.W. . . . . 1 *Melanostomias heteropogon* (22 mm.).
2 *Photonectes intermedius* (24, 30 mm.).
3 *Idiacanthus fasciola* (50—65 mm.).

St. 1045. Atlantic (32° 21′ N. 64° 15′ W.).
80 M.W. . . . . 1 *Eustomias obscurus* (77 mm.).
3 *Melanostomias spilorhynchus* (27 mm.).
1 *Haplostomias tentaculatus* (20 mm.).
7 *Idiacanthus fasciola* (61—191 mm.).
1 *Photostomias guernei* (37 mm.).

St. 1053. Atlantic (32° 03′ N. 62° 01′ W.).
80 M.W. . . . . 1 *Photostomias guernei* (32 mm.).

St. 1056. Atlantic (30° 53′ N. 52° 47′ W.).
65 M.W. . . . . 1 *Eustomias obscurus* (59 mm.).
110 M.W. . . . . 1 *Bathophilus metallicus* (31 mm.).

St. 1057. Atlantic (30° 23′ N. 48° 17′ W.).
80 M.W. . . . . 1 *Bathophilus metallicus* (38 mm.).
1 *Idiacanthus fasciola* (71 mm.).

St. 1058. Atlantic (29° 24′ N. 48° 08′ W.).
65 M.W. . . . . 1 *Idiacanthus fasciola* (75 mm.).
80 M.W. . . . . 3 — — (54—105 mm.).
110 M.W. . . . . 2 — — (68, 190 mm.).
5 *Melanostomias albibarba* (20—25 mm.).
1 — *valdiviæ* (24 mm.).
1 *Bathophilus longipinnis* (37 mm.).
1 *Eustomias dendriticus* (64 mm.).
2 *Photostomias guernei* (34, 39 mm.).

St. 1059. Atlantic (28° 22′ N. 46° 20′ W.).
65 M.W. . . . . 1 *Bathophilus metallicus* (32 mm.).
1 *Idiacanthus fasciola* (52 mm.).
80 M.W. . . . . 1 *Eustomias obscurus* (96 mm.).

St. 1060. Atlantic (25° 34′ N. 46° 06′ W.).
80 M.W. . . . . 1 *Bathophilus nigerrimus* (19 mm.).
110 M.W. . . . . 2 *Eustomias obscurus* (94, 110 mm.).
1 *Idiacanthus fasciola* (70 mm.).
150 M.W. . . . . 1 — — (57 mm.).
1 *Bathophilus longipes* (25 mm.).

St. 1061. Atlantic (24° 46′ N. 46° 06′ W.).
25 M.W. . . . . 1 *Bathophilus nigerrimus* (17 mm.).
1 *Eustomias obscurus* (105 mm.).
80 M.W. . . . . 1 *Bathophilus nigerrimus* (18 mm.).
150 M.W. . . . . 1 *Lamprotoxus phanobrochus* (27 mm.).
2 *Photostomias guernei* (24, 27 mm.).

St. 1063. Atlantic (21° 47′ N. 47° 11′ W.).
110 M.W. . . . . 3 *Photostomias guernei* (23—25 mm.).
1 *Eustomias triramis* (73 mm.).
1 *Melanostomias melanopogon* (27 mm.).

St. 1064. Atlantic (23° 00′ N. 49° 57′ W.).
110 M.W. ..... 1 *Haplostomias bituberatus* (20 mm.).
2 *Idiacanthus fasciola* (63, 80 mm.).
1 *Photostomias guernei* (36 mm.).
St. 1065. Atlantic (23° 36′ N. 51° 17′ W.).
65 M.W. ..... 1 *Bathophilus schizochirus* (20 mm.).
110 M.W. ..... 4 *Photostomias guernei* (25—27 mm.).
St. 1066. Atlantic (24° 43′ N. 52° 18′ W.).
80 M.W. ..... 1 *Eustomias obscurus* (114 mm.).
110 M.W. ..... 1 *Haplostomias tentaculatus* (30 mm.).
St. 1067. Atlantic (25° 35′ N. 53° 13′ W.).
10 M.W. ..... 1 *Bathophilus metallicus* (45 mm.).
110 M.W. ..... 2 *Melanostomias spilorhynchus* (30, 41 mm.).
150 M.W. ..... 1 *Bathophilus metallicus* (50 mm.).
St. 1072. Atlantic (20° 26′ N. 61° 03′ W.).
80 M.W. ..... 2 *Bathophilus metallicus* (25, 45 mm.).
1 *Eustomias simplex* (50 mm.).
150 M.W. ..... 1 *Photonectes achirus* (20 mm.).
300 M.W. ..... 1 *Eustomias paucifilis* (68 mm.).
1 *Chirostomias pliopterus* (70 mm.).
St. 1073. Atlantic (19° 32′ N. 63° 01′ W.).
25 M.W. ..... 1 *Idiacanthus fasciola* (55 mm.).
St. 1107. Atlantic (36° 28′ N. 8° 38′ W.).
75 M.W. ..... 1 *Eustomias obscurus* (77 mm.).
100 M.W. ..... 1 *Bathophilus metallicus* (62 mm.).
300 M.W. ..... 1 *Eustomias monodactylus* (50 mm.).
St. 1108. Atlantic (35° 11′ N. 8° 28′ W.).
200 M.W. ..... 1 *Bathophilus metallicus* (54 mm.).
300 M.W. ..... 2 — — (31, 35 mm.).
St. 1110. Atlantic (34° 18′ N. 8° 10′ W.).
400 M.W. ..... 1 *Bathophilus metallicus* (50 mm.).
St. 1113. Atlantic (36° 10′ N. 6° 42′ W.).
300 M.W. ..... 1 *Bathophilus metallicus* (48 mm.).
St. 1116. Atlantic (35° 18′ N. 6° 51′ W.).
250 M.W. ..... 1 *Leptostomias longibarba* (53 mm.).
1 *Bathophilus metallicus* (60 mm.).
St. 1140. Atlantic, off Madeira (32° 45′ N. 16° 20′ W.).
400 M.W. ..... 1 *Melanostomias spilorhynchus* (27 mm.).
St. 1141. Atlantic (34° 15′ N. 16° 53′ W.).
200 M.W. ..... 1 *Bathophilus metallicus* (35 mm.).
300 M.W. ..... 1 — — (45 mm.).
6 *Eustomias obscurus* (73—171 mm.).
350 M.W. ..... 5 — — (68—79 mm.).
1 *Bathophilus metallicus* (25 mm.).
400 M.W. ..... 10 — — (35—60 mm.).
3 *Eustomias obscurus* (74—80 mm.).
500 M.W. ..... 12 *Bathophilus metallicus* (25—138 mm.).

St. 1141. Atlantic (34° 15′ N. 16° 53′ W.).

500 M.W.	3	*Eustomias obscurus* (79—88 mm.).
600 M.W.	1	— — (82 mm.).
	6	*Bathophilus metallicus* (35—40 mm.).
	1	*Melanostomias spilorhynchus* (39 mm.).

St. 1142. Atlantic, off Madeira (33° 26′ N. 16° 59′ W.).

300 M.W.	2	*Eustomias obscurus* (54, 58 mm.).
	1	*Eustomias* sp. (48 mm.).
	5	*Bathophilus metallicus* (50—75 mm.).
400 M.W.	2	— — (60, 70 mm.).
	1	*Eustomias obscurus* (75 mm.).
600 M.W.	16	— — (60—88 mm.).
	5	*Bathophilus metallicus* (30—55 mm.).
	3	*Melanostomias spilorhynchus* (28—30 mm.).
1000 M.W.	1	*Chirostomias pliopterus* (33 mm.).
	1	*Photostomias guernei* (50 mm.).
2000 M.W.	1	*Bathophilus metallicus* (27 mm.).
3000 M.W.	1	*Flagellostomias boureei* (52 mm.).
	2	*Photonectes ovibarba* (24, 25 mm.).
4000 M.W.	1	— — (22 mm.).
5000 M.W.	1	*Photostomias guernei* (73 mm.).

St. 1145. Atlantic, S. of Madeira (32° 07′ N. 16° 50′ W.).

200 M.W.	1	*Bathophilus metallicus* (75 mm.).
300 M.W.	1	— — (60 mm.).
400 M.W.	3	— — (35—60 mm.).
	5	*Eustomias obscurus* (64—93 mm.).
500 M.W.	8	— — (60—82 mm.).
	2	*Bathophilus metallicus* (40, 60 mm.).

St. 1146. Atlantic (32° 00′ N. 19° 11′ W.).

300 M.W.	1	*Bathophilus metallicus* (50 mm.).
400 M.W.	12	— — (35—65 mm.).
	9	*Eustomias obscurus* (68—85 mm.).
	1	— *tetranema* (65 mm.).
500 M.W.	4	— *obscurus* (75—82 mm.).

St. 1147. Atlantic (32° 00′ N. 20° 01′ W.).

300 M.W.	1	*Bathophilus longipes* (35 mm.).
400 M.W.	1	*Eustomias obscurus* (75 mm.).
500 M.W.	1	*Bathophilus metallicus* (65 mm.).
	1	*Melanostomias spilorhynchus* (30 mm.).

St. 1148. Atlantic (32° 55′ N. 21° 51′ W.).

400 M.W.	1	*Bathophilus longipes* (32 mm.).
	1	*Eustomias obscurus* (85 mm.).
	1	*Photostomias guernei* (45 mm.).
500 M.W.	1	*Bathophilus metallicus* (60 mm.).
	1	*Eustomias tetranema* (55 mm.).
	1	— *longibarba* (70 mm.).
	1	*Photonectes ovibarba* (27 mm.).
	1	— *fimbria* (55 mm.).

St. 1149. Atlantic (33° 22′ N. 21° 55′ W.).		
	400 M.W.	1 *Eustomias obscurus* (75 mm.).
St. 1150. Atlantic (31° 54′ N. 21° 58′ W.).		
	300 M.W.	2 *Eustomias obscurus* (71, 83 mm.).
St. 1152. Atlantic (30° 17′ N. 20° 44′ W.).		
	300 M.W.	3 *Eustomias obscurus* (81—91 mm.).
	600 M.W.	1 *macronema* (67 mm.).
		4 — *obscurus* (70—79 mm.).
		1 *Melanostomias spilorhynchus* (36 mm.).
		1 *Photonectes ovibarba* (26 mm.).
	7000 M.W.	1 *Bathophilus metallicus* (75 mm.).
		1 *Malacosteus niger* (145 mm.).
St. 1153. Atlantic (28° 48′ N. 20° 45′ W.).		
	300 M.W.	1 *Bathophilus metallicus* (65 mm.).
		7 *Eustomias obscurus* (70—93 mm.).
	400 M.W.	1 *Leptostomias ramosus* (64 mm.).
		2 *Eustomias obscurus* (65, 70 mm.).
		1 *Idiacanthus fasciola* (158 mm.).
	500 M.W.	3 — — (68—182 mm.).
St. 1154. Atlantic (27° 58′ N. 20° 52′ W.).		
	200 M.W.	4 *Eustomias obscurus* (65—90 mm.).
St. 1155. Atlantic (26° 15′ N. 20° 53′ W.).		
	100 M.W.	9 *Eustomias obscurus* (68—99 mm.).
	200 M.W.	2 *Idiacanthus fasciola* (55, 260 mm.).
	300 M.W.	1 *Eustomias obscurus* (75 mm.).
	400 M.W.	2 (86, 139 mm.).
		1 *patulus* (135 mm.).
		1 *Leptostomias ramosus* (72 mm.).
		4 *Idiacanthus fasciola* (58—235 mm.).
St. 1156. Atlantic (25° 11′ N. 20° 57′ W.).		
	100 M.W.	2 *Eustomias obscurus* (70 mm.).
	300 M.W.	1 *Idiacanthus fasciola* (130 mm.).
	600 M.W.	1 *Eustomias filifer* (77 mm.).
		1 *Photostomias guernei* (50 mm.).
	1000 M.W.	1 *Photonectes monodactylus* (180 mm.).
	3000 M.W.	1 *Photostomias guernei* (103 mm.).
	4000 M.W.	1 *Eustomias obscurus* (52 mm.).
	5000 M.W.	1 *Photonectes dinema* (38 mm.).
		1 *Idiacanthus fasciola* (40 mm.).
St. 1157. Atlantic (21° 57′ N. 22° 58′ W.).		
	Surface	1 *Photostomias guernei* (74 mm.).
	300 M.W.	1 *Leptostomias ramosus* (65 mm.).
		1 *Eustomias melanobolus* (60 mm.).
		2 *Idiacanthus fasciola* (53, 182 mm.).
	500 M.W.	1 *Eustomias obscurus* (92 mm.).
		2 *Photostomias guernei* (64, 69 mm.).
	600 M.W.	1 — — (100 mm.).

St. 1157. Atlantic (21° 57′ N. 22° 58′ W.).

1000 M.W. ..... 1 *Bathophilus nigerrimus* (18 mm.).
1 *Photonectes intermedius* (33 mm.).
2000 M.W. ..... 1 *Photostomias guernei* (53 mm.).
5000 M.W. ..... 1 *Flagellostomias boureei* (57 mm.).

St. 1158. Atlantic, N. of C. Verde Islands (19° 22′ N. 24° 06′ W.).

500 M.W. ..... 1 *Eustomias obscurus* (133 mm.).
1 — *botrypogon* (185 mm.).
1 — *monodactylus* (82 mm.).
1 *Photostomias guernei* (65 mm.).

St. 1159. Atlantic, off C. Verde Islands (17° 55′ N. 24° 35′ W.).

1000 M.W. ..... 1 *Flagellostomias boureei* (273 mm.).
2000 M.W. ..... 1 — — — (39 mm.).
3000 M.W. ..... 1 *Idiacanthus fasciola* (40 mm.).

St. 1160. Atlantic, off C. Verde Islands (15° 50′ N. 26° 32′ W.).

300 M.W. ..... 1 *Eustomias obscurus* (140 mm.).
1 — *dactylobolus* (88 mm.).
1 *Melanostomias spilorhynchus* (112 mm.).
1 *Photostomias guernei* (85 mm.).
1000 M.W. ..... 1 *Leptostomias gracilis* (70 mm.).

St. 1161. Atlantic (14° 52′ N. 28° 04′ W.).

100 M.W. ..... 2 *Eustomias obscurus* (102, 108 mm.).
1 *Melanostomias spilorhynchus* (31 mm.).
300 M.W. ..... 1 *Photonectes leucospilus* (50 mm.).
600 M.W. ..... 1 *Aristostomias grimaldii* (35 mm.).

St. 1162. Atlantic (13° 35′ N. 30° 11′ W.).

100 M.W. ..... 1 *Eustomias obscurus* (92 mm.).
300 M.W. ..... 2 — — (102 mm.).
2 — *melanonema* (85, 91 mm.).
1 — *brevifilis* (83 mm.).
3 *Leptostomias gracilis* (73—75 mm.).
1 *Photostomias guernei* (54 mm.).
1 *Aristostomias xenostoma* (27 mm.).
600 M.W. ..... 2 *Flagellostomias boureei* (43, 49 mm.).
1000 M.W. ..... 1 *Bathophilus brevis* (48 mm).
1 *Aristostomias xenostoma* (75 mm.).

St. 1163. Atlantic (12° 59′ N. 32° 49′ W.).

300 M.W. ..... 2 *Melanostomias spilorhynchus* (30, 32 mm.).
600 M.W. ..... 1 *Flagellostomias boureei* (215 mm.).
1 *Aristostomias xenostoma* (94 mm.).

St. 1165. Atlantic (12° 11′ N. 35° 49′ W.).

300 M.W. ..... 1 *Eustomias dactylobolus* (68 mm.).
1000 M.W. ..... 1 — *obscurus* (103 mm.).
1 — *brevifilis* (105 mm.).
1 *Photostomias guernei* (84 mm.).
2000 M.W. ..... 2 *Eustomias paucifilis* (68, 70 mm.).
1 *Echiostoma tanneri* (30 mm.).

St. 1165. Atlantic (12° 11′ N. 35° 49′ W.).

3000 M.W.	1	*Thysanactis dentex* (114 mm.).
5000 M.W.	1	*Eustomias obscurus* (120 mm.).

St. 1166. Atlantic (10° 16′ N. 40° 41′ W.).

100 M.W.	1	*Bathophilus pawneei* (28 mm.).
	1	*Eustomias ramulosus* (84 mm.).
	1	— *monodactylus* (82 mm.).
1000 M.W.	1	*Aristostomias xenostoma* (102 mm.).

St. 1168. Atlantic (9° 30′ N. 42° 41′ W.).

100 M.W.	1	*Echiostoma tanneri* (36 mm.).
300 M.W.	1	*Haplostomias tentaculatus* (100 mm.).

St. 1171. Atlantic (8° 19′ N. 44° 35′ W.).

100 M.W.	3	*Bathophilus pawneei* (30—37 mm.).
300 M.W.	1	— — (72 mm.).
	1	*Leptostomias longibarba* (250 mm.).
	1	*Aristostomias xenostoma* (90 mm.).
600 M.W.	1	*Bathophilus pawneei* (116 mm.).
2000 M.W.	2	*Aristostomias xenostoma* (22, 36 mm.).
	1	*Malacosteus niger* (115 mm.).
3000 M.W.	1	— — (30 mm.).
	1	*Aristostomias xenostoma* (34 mm.).
	1	— *tittmanni* (45 mm.).
5000 M.W.	1	*Malacosteus niger* (30 mm.).

St. 1172. Atlantic (7° 22′ N. 46° 51′ W.).

600 M.W.	1	*Photonectes monodactylus* (195 mm.).

St. 1174. Atlantic, off French Guiana (5° 35′ N. 51° 08′ W.).

300 M.W.	1	*Eustomias bituberatus* (65 mm.).
600 M.W.	1	— *brevibarbatus* (105 mm.).
1000 M.W.	1	*Aristostomias grimaldii* (110 mm.).

St. 1175. Atlantic, off French Guiana (5° 06′ N. 51° 35′ W.).

400 M.W.	1	*Bathophilus brevis* (45 mm.).

St. 1178. Atlantic (10° 24′ N. 54° 38′ W.).

100 M.W.	2	*Melanostomias macrophotus* (20, 25 mm.).
300 M.W.	1	*Eustomias schmidti* (70 mm.).
	2	— *brevibarbatus* (84, 145 mm.).
	1	*Idiacanthus fasciola* (276 mm.).
	1	*Aristostomias xenostoma* (40 mm.).

St. 1180. Atlantic (12° 11′ N. 57° 12′ W.).

300 M.W.	1	*Thysanactis dentex* (63 mm.).
	1	*Eustomias bituberatus* (87 mm.).
500 M.W.	1	*Melanostomias heteropogon* (62 mm.).
600 M.W.	1	*Eustomias variabilis* (66 mm.).

St. 1181. Atlantic (13° 07′ N. 57° 20′ W.).

1000 M.W.	1	*Bathopilus pawneei* (70 mm.).
	1	*Aristostomias xenostoma* (60 mm.).
3000 M.W.	1	— — (25 mm.).

St. 1181. Atlantic (13° 07′ N. 57° 20′ W.).

3000 M.W. ..... 1 *Idiacanthus fasciola* (35 mm.).

4000 M.W. ..... 1 *Melanostomias albibarba* (28 mm.).

St. 1182. Atlantic, E. of Barbados (13° 03′ N. 59° 50′ W.).

100 M.W. ..... 1 *Idiacanthus fasciola* (100 mm.).

300 M.W. ..... 4 — — (130—210 mm.).

600 M.W. ..... 1 — — (145 mm.).

1 *Bathophilus pawneei* (49 mm.).

1 *Eustomias polyaster* (65 mm.).

1000 M.W. ..... *Aristostomias sp.* (115 mm.).

St. 1183. Caribbean Sea, W. of St. Lucia. (13° 47′ N. 61° 26′ W.).

300 M.W. ..... 1 *Photonectes phyllopogon* (21 mm.).

1 *Echiostoma tanneri* (223 mm.).

500 M.W. ..... 1 *Thysanactis dentex* (139 mm.).

600 M.W. ..... 1 *Lamprotoxus phanobrochus* (30 mm.).

2 *Bathophilus pawneei* (28, 35 mm.).

1 *Aristostomias xenostoma* (34 mm.).

2500 M.W. ..... 1 *Bathophilus pawneei* (28 mm.).

1 *Melanostomias albibarba* (30 mm.).

1 *Ichiacantus fasciola* (34 mm.).

3000 M.W. ..... 1 *Bathophilus pawneei* (20 mm.).

1 *Melanostomias albibarba* (53 mm.).

4 *Idiacanthus fasciola* (40—50 mm.).

1 *Malacosteus niger* (41 mm.).

3500 M.W. ..... 1 *Pachystomias atlanticus* (165 mm.).

2 *Eustomias brevibarbatus* (125, 142 mm.).

4000 M.W. ..... 1 *Flagellostomias boureei* (322 mm.).

1 *Eustomias stigmatopleura* (116 mm.).

1 — *variabilis* (145 mm.).

1 *Aristostomias xenostoma* (112 mm.).

1 — *tittmanni* (88 mm.).

St. 1184. Caribbean Sea, off Dominica. (15° 08′ N. 61° 31′ W.).

300 M.W. ..... 1 *Thysanactis dentex* (110 mm.).

1 *Leptostomias leptobolus* (68 mm.).

1 *Eustomias micraster* (72 mm.).

1 *Melanostomias albibarba* (39 mm.).

2 — *macrophotus* (27, 30 mm.).

1 *Photonectes intermedius* (24 mm.).

600 M.W. ..... 1 *Bathophilus longipes* (24 mm.).

3 — *pawneei* (25—32 mm.).

1 *Aristostomias xenostoma* (103 mm.).

800 M.W. ..... 1 *Melanostomias macrophotus* (28 mm.).

1 *Idiacanthus fasciola* (124 mm.).

1000 M.W. ..... 1 *Eustomias brevibarbatus* (148 mm.).

St. 1185. Atlantic, E. of Barbuda. (17° 41′ N. 60° 58′ W.).

100 M.W. ..... 2 *Idiacanthus fasciola* (50, 120 mm.).

1 *Photostomias guernei* (35 mm.).

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St. 1185. Atlantic, E. of Barbuda (17° 41′ N. 60° 58′ W.).

300 M.W. ..... 1 *Leptostomias leptobolus* (95 mm.).
1 *Thysanactis dentex* (54 mm.).
4 *Photostomias guernei* (22—57 mm.).
600 M.W. ..... 2 *Idiacanthus fasciola* (70, 155 mm.).
1 *Photostomias guernei* (48 mm.).
800 M.W. ..... 1 — — (25 mm.).
1 *Bathophilus pawneei* (32 mm.).
1 — *nigerrimus* (62 mm.).
1000 M.W. ..... 1 *Photonectes achirus* (43 mm.).
1 *Photostomias guernei* (32 mm.).
1500 M.W. ..... 1 *Eustomias dubius* (72 mm.).
2 *Idiacanthus fasciola* (191, 222 mm.).
3000 M.W. ..... 1 *Photostomias guernei* (58 mm.).
4000 M.W. ..... 1 *Lamprotoxus panobrochus* (34 mm.).
5000 M.W. ..... 1 *Idiacanthus fasciola* (37 mm.).

St. 1186. Caribbean Sea, off St. Croix (17° 58.5′ N. 64° 41′ W. and 17° 54′ N. 64° 54′ W.).

100 M.W. ..... 1 *Eustomias pyrifer* (135 mm.).
6 *Idiacanthus fasciola* (65—150 mm.).
300 M.W. ..... 1 *Melanostomias albibarba* (40 mm.).
1 *Idiacanthus fasciola* (142 mm.).
1000 M.W. ..... 1 *Eustomias micraster* (70 mm.).
1 *Photonectes monodactylus* (250 mm.).
2000 M.W. ..... 1 *Eustomias monoclonus* (76 mm.).
3000 M.W. ..... 4 *Idiacanthus fasciola* (35—48 mm.).

St. 1188. Caribbean Sea, off St. Croix (17° 43.7′ N. 64° 57′ W.).

300 M.W. ..... 1 *Eustomias variabilis* (98 mm.).
600 M.W. ..... 1 — *brevibarbatus* (140 mm.).
1000 M.W. ..... 1 *Photostomias guernei* (62 mm.).

St. 1189. Caribbean Sea, off St. Croix (17° 58.5′ N. 64° 41′ W.).

100 M.W. ..... 1 *Eustomias brevibarbatus* (130 mm.).
300 M.W. ..... 1 — *micraster* (68 mm.).
2 *Idiacanthus fasciola* (110, 264 mm.).
2 *Photostomias guernei* (83, 86 mm.).
600 M.W. ..... 1 — — (87 mm.).
2000 M.W. ..... 1 *Aristostomias polydactylus* (35 mm.).
3 *Bathopilus pawneei* (38—60 mm.).
1 *Eustomias variabilis* (79 mm.).
1 *Idiacanthus fasciola* (33 mm.).
3000 M.W. ..... 1 — — (35 mm.).
2 *Malacosteus niger* (24, 63 mm.).

St. 1190. Caribbean Sea, N. of St. Croix (17° 58.5′ N. 65° 45′ W.).

100 M.W. ..... 1 *Idiacanthus fasciola* (170 mm.).
300 M.W. ..... 1 *Haplostomias tentaculatus* (26 mm.).
1 *Photostomias guernei* (90 mm.).
1 *Aristostomias polydactylus* (31 mm.).
1000 M.W. ..... 1 — — (33 mm.).

St. 1191. Caribbean Sea, N. of St. Croix, (17° 49′ N. 64° 54′ W.).
300 M.W. ..... 1 *Bathophilus pawneei* (110 mm.).
600 M.W. ..... 1 *Eustomias polyaster* (122 mm.).
St. 1192. Caribbean Sea, N. of St. Croix (17° 43.4′ N. 64° 54.3′ W.).
600 M.W. ..... 1 *Leptostomias analis* (168 mm.).
1 *Bathophilus pawneei* (64 mm.).
1 *Idiacanthus fasciola* (49 mm.).
St. 1194. Caribbean Sea, N. of St. Croix (17° 58.5′ N. 64° 41′ W.).
100 M.W. ..... 1 *Idiacanthus fasciola* (92 mm.).
300 M.W. ..... 1 *Eustomias fissibarbis* (63 mm.).
1 — *brevibarbatus* (68 mm.).
320 M.W. ..... 3 *Idiacantus fasciola* (60—108 mm.).
600 M.W. ..... 1 *Eustomias polyaster* (65 mm.).
St. 1195. Atlantic, N. of Virgin Islands. (19° 01′ N. 65° 23′ W.).
300 M.W. ..... 2 *Eustomias micraster* (68, 72 mm.).
1 — *bimargaritatus* (72 mm.).
4 *Photostomias guernei* (70—80 mm.).
600 M.W. ..... 2 — — (70, 90 mm.).
1 *Aristostomias lunifer* (28 mm.).
St. 1196. Caribbean Sea, off St. Croix (17° 43′ N. 64° 56′ W.).
600 M.W. ..... 1 *Eustomias brevibarbatus* (57 mm.).
St. 1198. Caribbean Sea, off St. Croix. (17° 43′ N. 64° 56′ W.).
100 M.W. ..... 1 *Bathophilus pawneei* (60 mm.).
200 M.W. ..... 1 — — (30 mm.).
1 *Idiacanthus fasciola* (118 mm.).
500 M.W. ..... 1 — — (50 mm.).
800 M.W. ..... 1 *Bathophilus pawneei* (65 mm.).
1200 M.W. ..... 1 *Eustomias fissibarbis* (90 mm.).
St. 1203. Gulf of Panama (7° 30′ N. 79° 19′ W.).
2500 M.W. ..... 1 *Bathophilus filifer* (55 mm.).
1 *Idiacanthus panamensis* (224 mm.).
3000 M.W. ..... 2 — — (121, 265 mm.).
3500 M.W. ..... 2 *Bathophilus filifer* (40, 70 mm.).
1 *Idiacanthus panamensis* (203 mm.).
1 *Malacosteus danæ* (146 mm.).
St. 1205. Gulf of Panama (6° 49′ N. 80° 25′ W.).
600 M.W. ..... 1 *Bathophilus filifer* (70 mm.).
St. 1206. Gulf of Panama. (6° 40′ N. 80° 47′ W.).
500 M.W. ..... 3 *Bathophilus filifer* (80 mm.).
800 M.W. ..... 1 *Idiacanthus panamensis* (240 mm.).
1200 M.W. ..... 1 *Bathophilus filifer* (80 mm.).
2500 M.W. ..... 2 — — (25, 28 mm.).
1 *Idiacanthus panamensis* (45 mm.).
3000 M.W. ..... 1 — — (272 mm.).
2 *Bathophilus filifer* (35, 70 mm.).
3500 M.W. ..... 1 — — (68 mm.).
1 *Idiacanthus panamensis* (37 mm.).

St. 1206. Gulf of Panama (6° 40′ N. 80° 47′ W.).

4000 M.W.	1	*Idiacanthus panamensis*	(45 mm.).
4500 M.W.	1	*Bathophilus filifer*	(81 mm.).

St. 1208. Gulf of Panama. (6° 48′ N. 80° 33′ W.).

600 M.W.	3	*Bathophilus filifer*	(68—80 mm.).
1000 M.W.	3	—	— (68—75 mm.).
1600 M.W.	1	*Idiacanthus panamensis*	(220 mm.).
2000 M.W.	1	—	— (204 mm.).
	3	—	— (38—50 mm.).
2100 M.W.	10	—	— (45—288 mm.).
2500 M.W.	3	—	— (40—47 mm.).
	5	*Bathophilus filifer*	(25—30 mm.).
2600 M.W.	3	*Idiacanthus panamensis*	(250—278 mm.).
	1	—	— (41 mm.).
3000 M.W.	1	—	— (194 mm.).
	7	—	— (40—48 mm.).
3100 M.W.	2	—	— (54, 212 mm.).
3500 M.W.	1	—	— (140 mm.).
3600 M.W.	1	—	— (186 mm.).

St. 1209. Gulf of Panama (7° 15′ N. 78° 54′ W.).

2500 M.W.	1	*Bathophilus filifer*	(72 mm.).
	2	*Idiacanthus panamensis*	(276, 298 mm.).
	2	—	— (48 mm).
3000 M.W.	4	—	— (42—49 mm.).
3500 M.W.	1	*Malacosteus dana*	(130 mm.).

St. 1215. Caribbean Sea, S. of Jamaica (16° 06′ N. 76° 02′ W.).

300 M.W.	1	*Bathophilus longipes*	(24 mm.).

St. 1216. Caribbean Sea, W. of Jamaica. (18° 22′ N. 78° 38′ W.).

Surface	1	*Idiacanthus fasciola*	(115 mm.).
50 M.W.	1	—	— (50 mm.).
100 M.W.	1	—	— (53 mm.).
	1	*Melanostomias macrophotus*	(35 mm).
300 M.W.	1	*Bathophilus longipes*	(26 mm).
	1	*Melanostomias margarilifer*	(52 mm.).
	1	*Echiostoma tanneri*	(25 mm.).
600 M.W.	1	*Eustomias variabilis*	(114 mm.).

St. 1217. Caribbean Sea, W. of Jamaica (18° 50′ N. 79° 07′ W.).

500 M.W.	1	*Bathophilus longipes*	(22 mm.).
1500 M.W.	1	*Idiacanthus fasciola*	(53 mm.).
2000 M.W.	1	*Eustomias longibarba*	(116 mm.).
	2	*Aristostomias polydactylus*	(35 mm.).
2500 M.W.	3	*Idiacanthus fasciola*	(35 mm.).
	1	*Eustomias (Dinematochirus)*	sp. (57 mm.).

St. 1218. Caribbean Sea, S. of Cuba. (20° 08′ N. 82° 59′ W.).

300 M.W.	1	*Echiostoma tanneri*	(25 mm.).
1000 M.W.	1	*Photostomias guernei*	(90 mm.).

St. 1223. G. of Mexico, N. W. of Cuba. (22° 06′ N. 84° 58′ W.).

50 M.W. ..... 1 *Aristostomias polydactylus* (31 mm.).
100 M.W. ..... 5 *Echiostoma tanneri* (30—36 mm.).
300 M.W. ..... 2 — — (25, 27 mm.).
1 *Eustomias fissibarbis* (100 mm.).
1 *Photostomias guernei* (52 mm.).
500 M.W. ..... 1 *Bathophilus longipes* (26 mm.).
1 *Echiostoma tanneri* (25 mm.).
2 *Idiacanthus fasciola* (200, 215 mm.).
600 M.W. ..... 1 *Eustomias fissibarbis* (82 mm.).
1 *Photonectes monodactylus* (255 mm.).
3 *Photostomias guernei* (61—92 mm.).

St. 1225. G. of Mexico, N. of Cuba (23° 58′ N. 83° 22′ W.).

50 M.W. ..... 3 *Echiostoma tanneri* (35—39 mm.).
1 *Aristostomias tittmanni* (42 mm.).
100 M.W. ..... 1 *Bathophilus nigerrimus* (20 mm.).
7 *Echiostoma tanneri* (25—40 mm.).
600 M.W. ..... 7 *Photostomias guernei* (25—28 mm.).

St. 1228. Between Florida and Cuba (23° 35′ N. 81° 54′ W.).

50 M.W. ..... 1 *Echiostoma tanneri* (40 mm.).
100 M.W. ..... 11 — — (23—39 mm.).
1 *Aristostomias polydactylus* (33 mm.).
300 M.W. 4 *Echiostoma tanneri* (30—32 mm.).
2 *Photostomias guernei* (30, 31 mm.).
600 M.W. ..... 1 *Eustomias fissibarbis* (57 mm.).
1 *Photostomias guernei* (36 mm.).
1 *Aristostomias xenostoma* (30 mm.).
1 — *polydactylus* (31 mm.).
1000 M.W. ..... 1 *Echiostoma tanneri* (35 mm.).

St. 1229. Between Florida and Cuba (23° 13′ N. 82° 21′ W.).

50 M.W. ..... 1 *Eustomias brevibarbatus* (112 mm.).
1 *Echiostoma tanneri* (25 mm.).
100 M.W. ..... 1 *Bathophilus nigerrimus* (16 mm.).
4 *Echiostoma tanneri* (23—40 mm.).
1 *Photonectes intermedius* (25 mm.).
300 M.W. ..... 1 *Eustomias fissibarbis* (65 mm.).
2 *Echiostoma tanneri* (20 mm.).
600 M.W. ..... 1 *Bathophilus longipes* (30 mm.).
8 *Echiostoma tanneri* (26—40 mm.).

St. 1230. Between Florida and Cuba (23° 13′ N. 82° 21′ W.).

600 M.W. ..... 9 *Echiostoma tanneri* (23—45 mm.).
1 *Bathophilus longipes* (24 mm.).
800 M.W. ..... 1 *Echiostoma tanneri* (23 mm.).
1 *Eustomias leptobolus* (95 mm.).
2 *Photostomias guernei* (96, 98 mm.).
1000 M.W. ..... 4 *Echiostoma tanneri* (22—45 mm.).
3 *Photostomias guernei* (30—60 mm.).

St. 1230. Between Florida and Cuba (23° 13′ N. 82° 21′ W.).
1200 M.W. ..... 4 *Photostomias guernei* (25—70 mm.).
1500 M.W. ..... 1 *Echiostoma tanneri* (42 mm.).
1 *Aristostomias grimaldii* (35 mm.).
St. 1231. Florida Strait (24° 30′ N. 80° 00′ W.).
300 M.W. ..... 1 *Bathophilus nigerrimus* (19 mm.).
1 — *longipes* (34 mm.).
6 *Echiostoma tanneri* (25—40 mm.).
600 M.W. ..... 3 — — (21—45 mm.).
1 *Bathophilus longipinnis* (26 mm.).
1 *Eustomias bigelowi* (56 mm.).
1 *Photostomias guernei* (105 mm.).
1000 M.W. ..... 1 *Bathophilus longipes* (24 mm.).
St. 1236. Florida Strait (25° 37′ N. 79° 33′ W.).
300 M.W. ..... 1 *Bathophilus chironema* (53 mm.).
St. 1238. E. of Florida (26° 13′ N. 78° 48′ W.).
800 M.W. ..... 1 *Eustomias schmidti* (55 mm.).
St. 1239. Bahamas (25° 50′ N. 76° 55′ W.).
600 M.W. ..... 2 *Bathophilus melas* (20, 33 mm.).
800 M.W. ..... 1 *Eustomias frondosus* (85 mm.).
1 *Aristostomias polydactylus* (33 mm.).
1000 M.W. ..... 1 *Bathophilus schizochirus* (72 mm.).
1500 M.W. ..... 1 *Photostomias guernei* (33 mm.).
3000 M.W. ..... 1 — — (37 mm.).
1 *Idiacanthus fasciola* (37 mm.).
St. 1241. Atlantic, E. of Bahamas (25° 18′ N. 74° 00′ W.)
400 M.W. ..... 1 *Bathophilus metallicus* (30 mm.).
St. 1242. Atlantic (24° 05′ N. 74° 36′ W.).
300 M.W. ..... 1 *Eustomias longibarba* (98 mm.).
1 — *frondosus* (95 mm.).
1 *Idiacanthus fasciola* (50 mm).
1 *Photostomias guernei* (37 mm.).
600 M.W. ..... 1 *Eustomias frondosus* (95 mm.).
1000 M.W. ..... 1 *Photostomias guernei* (35 mm.).
1200 M.W. ..... 1 *Melanostomias melanopogon* (56 mm.).
1500 M.W. ..... 1 — — (59 mm.).
2000 M.W. ..... 1 *Photonectes ovibarba* (30 mm.).
1 *Photostomias guernei* (46, 60 mm.).
4000 M.W. ..... 1 *Photonectes monodactylus* (250 mm.).
St. 1245. Windward Passage, between Cuba and Haiti (20° 23′ N. 73° 24′ W.).
200 M.W. ..... 2 *Echiostoma tanneri* (70, 84 mm.).
St. 1247. Caribbean Sea, S. of Haiti (17° 57′ N. 72° 51′ W.).
300 M.W. ..... 1 *Idiacanthus fasciola* (50 mm.).
St. 1250. Caribbean Sea, near Porto Rico (17° 54′ N. 67° 30′ W.).
300 M.W. ..... 2 *Idiacanthus fasciola* (122, 236 mm.).
600 M.W. ..... 1 — — (55 mm.).
1000 M.W. ..... 1 — — (150 mm.).

St. 1253. Caribbean Sea, near St. Croix (17° 43′ N. 64° 56′ W.).

50 M.W. ..... 1 *Bathophilus nigerrimus* (17 mm.).
300 M.W. ..... 1 — *pawneei* (21 mm.).
600 M.W. ..... 1 — *longipes* (98 mm.).

St. 1256. Caribbean Sea, near St. Croix, (17° 43′ N. 64° 56′ W.).

300 M.W. ..... 2 *Bathophilus pawneei* (24, 28 mm.).
1 *Eustomias melanostigma* (106 mm.).
500 M.W. ..... 1 *Melanostomias macrophotus* (62 mm.).
600 M.W. ..... 1 — *albibarba* (50 mm.).
1 *Photostomias guernei* (84 mm.).

St. 1257. Caribbean Sea, near St. Croix (17° 43′ N. 64° 56′ W.).

300 M.W. ..... 1 *Eustomias variabilis* (66 mm.).
1 — *polyaster* (96 mm.).
1 *Idiacanthus fasciola* (192 mm.).
1000 M.W. ..... 1 *Eustomias micraster* (95 mm.).

St. 1260. Atlantic, N. of Porto Rico (18° 35′ N. 66° 00′ W.).

600 M.W. ..... 2 *Photostomias guernei* (56, 58 mm.).
800 M.W. ..... 1 *Eustomias polyaster* (97 mm.).
2 *Photostomias guernei* (96, 110 mm.).
1000 M.W. ..... 1 — — (65 mm.).

St. 1261. Atlantic, N. of Porto Rico (19° 04′ N. 65° 43′ W.).

100 M.W. ..... 1 *Idiacanthus fasciola* (110 mm.).
300 M.W. ..... 1 — — (140 mm.).
600 M.W. ..... 1 *Photostomias guernei* (51 mm.).
2500 M.W. ..... 1 *Eustomias obscurus* (55 mm.).
3 *Idiacanthus fasciola* (35—37 mm.).

St. 1266. Caribbean Sea, near St. Croix (17° 45′ N. 64° 55.5′ W.).

300 M.W. ..... 1 *Eustomias melanostigma* (95 mm.).
800 M.W. ..... 2 *Bathophilus pawneei* (67, 75 mm.).
1 — *longipes* (80 mm.).
1 *Eustomias silvescens* (111 mm.).

St. 1267. Caribbean Sea, near St. Croix (17° 56′ N. 64° 50′ W.).

2000 M.W. ..... 1 *Idiacanthus fasciola* (35 mm.).
3000 M.W. ..... 1 — — (68 mm.).
4000 M.W. ..... 3 — — (35—37 mm.).

St. 1268. Caribbean Sea, near St. Croix (17° 43′ N. 64° 56′ W.).

300 M.W. ..... 1 *Bathophilus pawneei* (28 mm.).

St. 1269. Caribbean Sea, S. of St. Croix (17° 13′ N. 64° 58′ W.).

600 M.W. ..... 1 *Bathophilus pawneei* (22 mm.).
1 *Eustomias variabilis* (56 mm.).
800 M.W. ..... 1 — *brevibarbatus* (82 mm.).
2000 M.W. ..... 1 — *variabilis* (57 mm.).
1 *Photonectes caerulescens* (116 mm.).
1 *Aristostomias xenostoma* (36 mm.).
4000 M.W. ..... 1 *Eustomias brevibarbatus* (127 mm.).
2 *Idiacanthus fasciola* (40, 53 mm.).

St. 1269. Caribbean Sea, S. of St. Croix (17° 13′ N. 64° 58′ W.).
4500 M.W. . . . . 1 *Eustomias polyaster* (62 mm.).
1 *Malacosteus niger* (80 mm.).
St. 1270. Caribbean Sea, near St. Croix (17° 43′ N. 64° 56′ W.).
700 M.W. . . . . 2 *Bathophilus pawneei* (60, 68 mm.).
1 *Eustomias bituberatus* (133 mm.).
1 *Idiacanthus fasciola* (65 mm.).
1000 M.W. . . . . 1 *Bathophilus pawneei* (70 mm.).
1 *Echiostoma tanneri* (150 mm.).
2 *Photostomias guernei* (25 mm.).
St. 1272. Caribbean Sea, near St. Croix (17° 43′ N. 64° 56′ W.).
300 M.W. . . . . 1 *Eustomias variabilis* (73 mm.).
600 M.W. . . . . 1 *Bathophilus pawneei* (50 mm.).
St. 1273. Caribbean Sea, near St. Croix (17° 43′ N. 64° 56′ W.).
50 M.W. . . . . 1 *Eustomias brevibarbatus* (74 mm.).
1 *Aristostomias grimaldii* (32 mm.).
500 M.W. . . . . 1 *Bathophilus pawneei* (52 mm.).
800 M.W. . . . . 1 *Eustomias lipochirus* (88 mm.).
900 M.W. . . . . 1 *Bathophilus longipes* (105 mm.).
1 *Eustomias dubius* (122 mm.).
St. 1274. Caribbean Sea, near St. Croix (17° 43′ N. 64° 56′ W.).
100 M.W. . . . . 1 *Bathophilus pawneei* (88 mm.).
1 *Melanostomias macrophotus* (82 mm.).
1 *Idiacanthus fasciola* (55 mm.).
St. 1278. Caribbean Sea, near St. Croix (17° 43′ N. 64° 56′ W.).
600 M.W. . . . . 1 *Bathophilus pawneei* (21 mm.).
St. 1279. Caribbean Sea, near St. Croix (17° 43′ N. 64° 56′ W.).
100 M.W. . . . . 1 *Bathophilus pawneei* (100 mm.).
300 M.W. . . . . 3 — — (20—37 mm.).
1 *Eustomias trituberatus* (70 mm.).
600 M.W. . . . . 5 *Bathophilus pawneei* (57—95 mm.).
1000 M.W. . . . . 1 — — (107 mm.).
1 *Eustomias xenobolus* (170 mm.).
St. 1280. Caribbean Sea, near St. Croix, (17° 43′ N. 64° 56′ W.).
100 M.W. . . . . 1 *Idiacanthus fasciola* (64 mm.).
300 M.W. . . . . 1 — — (185 mm.).
5 *Bathophilus pawneei* (20—55 mm.).
1 *Aristostomias xenostoma* (40 mm.).
St. 1281. Caribbean Sea, near St. Croix (17° 43′ N. 64° 56′ W.).
100 M.W. . . . . 1 *Eustomias trituberatus* (73 mm.).
1 *Melanostomias albibarba* (63 mm.).
1 *Aristostomias grimaldii* (51 mm.).
300 M.W. . . . . 1 *Bathophilus pawnei* (26 mm.).
1 *Photostomias guernei* (60 mm.).
500 M.W. . . . . 1 *Bathophilus pawneei* (34 mm.).
800 M.W. . . . . 1 — — (97 mm.).
1000 M.W. . . . . 1 — — (72 mm.).

St. 1282. Caribbean Sea, W. of Lesser Antilles (16° 03′ N. 62° 29′ W.).

300 M.W. ..... 1 *Idiacanthus fasciola* (196 mm.).

800 M.W. ..... 1 *Eustomias brevibarbatus* (136 mm.).

St. 1283. Caribbean Sea, near Martinique (14° 38′ N. 61° 16′ W.).

1000 M.W. ..... 1 *Bathophilus pawneei* (100 mm.).

2000 M.W. ..... 2 *Malacosteus niger* (48, 95 mm.).

3 *Idiacanthus fasciola* (37, 49, 140 mm.).

3000 M.W. ..... 1 *Bathophilus pawneei* (21 mm.).

St. 1284. Caribbean Sea, near Martinique (14° 38′ N. 61° 16′ W.).

300 M.W. ..... 1 *Photonectes achirus* (52 mm.).

1 *Eustomias variabilis* (145 mm.).

1 — *bituberatus* (115 mm.).

600 M.W. ..... 1 — — (114 mm.).

St. 1285. Caribbean Sea, near Martinique (14° 38′ N. 61° 16′ W.).

100 M.W. ..... 1 *Aristostomias xenostoma* (31 mm.).

300 M.W. ..... 1 *Photonectes achirus* (62 mm.).

1 *Bathophilus pawneei* (80 mm.).

600 M.W. ..... 1 — — (100 mm.).

1 *Eustomias globulifer* (70 mm.).

1000 M.W. 2 *Bathophilus pawneei* (68, 100 mm.).

1 *Melanostomias melanops* (242 mm.).

1 *Aristostomias xenostoma* (57 mm.).

St. 1288. Caribbean Sea, Lesser Antilles (16° 04′ N. 61° 52′ W.).

800 M.W. ..... 1 *Bathophilus pawneei* (112 mm.).

St. 1289. Caribbean Sea, near St. Croix (17° 43′ N. 64° 56′ W.).

300 M.W. ..... 9 *Bathophilus pawneei* (22—35 mm.).

500 M.W. 1 *Eustomias variabilis* (68 mm.).

1 *Idiacanthus fasciola* (270 mm.).

800 M.W. ..... 1 *Bathophilus pawneei* (95 mm.).

St. 1291. Caribbean Sea, near St. Croix (17° 43′ N. 64° 56′ W.).

100 M.W. ..... 1 *Eustomias trituberatus* (75 mm.).

1 *Bathophilus pawneei* (36 mm.).

300 M.W. ..... 1 — — (25 mm.).

3 *Eustomias variabilis* (68—70 mm.).

600 M.W. ... 1 *Bathophilus pawneei* (85 mm.).

800 M.W. ..... 3 — — (25—74 mm.).

1 *Idiacanthus fasciola* (? mm.)

1000 M.W. ..... 1 *Aristostomias lunifer* (93 mm.).

St. 1292. Caribbean Sea, near St. Croix (17° 43′ N. 64° 56′ W.).

300 M.W. ..... 4 *Bathophilus pawneei* (23—35 mm.).

1 *Eustomias fissibarbis* (137 mm.).

600 M.W. ..... 2 *Bathophilus pawneei* (58, 84 mm.).

1 *Eustomias dubius* (122 mm.).

St. 1293. Caribbean Sea, near St. Croix (17° 43′ N. 64° 56′ W.).

100 M.W. ..... 1 *Haplostomias tentaculatus* (67 mm.).

2 *Idiacanthus fasciola* (65, 76 mm.).

300 M.W. 3 *Bathophilus pawneei* (24—88 mm.).

St. 1293. Caribbean Sea, near St. Croix (17° 43′ N. 64° 56′ W.).

300 M.W.	1	*Eustomias variabilis* (63 mm.).
600 M.W.	1	— — (60 mm.).
	1	— *polyaster* (132 mm.).
	3	*Bathophilus pawneei* (28—72 mm.).
1000 M.W.	1	*Eustomias polyaster* (110 mm.).

St. 1294. Caribbean Sea, near St. Croix (17° 43′ N. 64° 56′ W.).

100 M.W.	1	*Idiacanthus fasciola* (90 mm.).
300 M.W.	2	— — (56 mm.).
	1	*Eustomias variabilis* (90 mm.).
	1	— *macrophthalmus* (100 mm.).
600 M.W.	1	*Bathophilus pawneei* (33 mm.).
	1	*Photostomias guernei* (60 mm.).

St. 1296. Caribbean Sea, near St. Croix (17° 43′ N. 64° 56′ W.).

100 M.W.	13	*Idiacanthus fasciola* (58—112 mm.).
600 M.W.	1	— — (73 mm.).

St. 1310. Caribbean Sea, near St. Croix (17° 43′ N. 64° 56′ W.).

300 M.W.	2	*Idiacanthus fasciola* (62, 78 mm.).

St. 1314. Caribbean Sea, near St. Croix (17° 43′ N. 64° 56′ W.).

80 M.W.	2	*Idiacanthus fasciola* (55—93 mm.).
100 M.W.	1	*Bathophilus pawneei* (40 mm.).
	8	*Idiacanthus fasciola* (47—60 mm.).
600 M.W.	1	— — (65 mm.).
1000 M.W.	1	*Aristostomias grimaldii* (117 mm.).

St. 1320. Atlantic (23° 18′ N. 56° 58′ W.).

300 M.W.	1	*Idiacanthus fasciola* (60 mm.).
600 M.W.	1	— — (72 mm.).
800 M.W.	1	*Aristostomias lunifer* (28 mm.).

St. 1321. Atlantic (24° 13′ N. 54° 36′ W.).

500 M.W.	1	*Idiacanthus fasciola* (69 mm.).

St. 1322. Atlantic (27° 02′ N. 53° 39′ W.).

150 M.W.	1	*Eustomias stigmatopleura* (63 mm.).
	1	— *enbarbatus* (65 mm.).
200 M.W.	1	— — (57 mm.).
	1	— *obscurus* (70 mm.).
	2	*Idiacanthus fasciola* (115, 130 mm.).
300 M.W.	1	*Eustomias obscurus* (60 mm.).
400 M.W.	1	*Photonectes dinema* (34 mm.).
500 M.W.	1	— — (30 mm.).
600 M.W.	1	*Idiacanthus fasciola* (155 mm.).
700 M.W.	1	— — (120 mm.).
	1	*Eustomias acinosus* (62 mm.).
	2	*Photostomias guernei* (28, 56 mm.).
1000 M.W.	1	*Idiacanthus fasciola* (250 mm.).
1100 M.W.	1	*Eustomias bibulbosus* (132 mm.).
1300 M.W.	1	*Idiacanthus fasciola* (35 mm.).
1900 M.W.	1	*Eustomias obscurus* (65 mm.).

St. 1322. Atlantic (27° 02′ N. 53° 39′ W.).
2500 M.W. ..... 1 *Eustomias stigmatopleura* (63 mm.).
3000 M.W. ..... 1 *Photonectes ovibarba* (25 mm.).
4000 M.W. ..... 1 *Idiacanthus fasciola* (38 mm.).
St. 1323. Atlantic (27° 17′ N. 54° 35′ W.).
1100 M.W. ..... 1 *Photostomias guernei* (72 mm.).
St. 1326. Atlantic (27° 14′ N. 51° 25′ W.).
300 M.W. ..... 1 *Bathophilus metallicus* (29 mm.).
600 M.W. ..... 1 *Idiacanthus fasciola* (230 mm.).
St. 1327. Atlantic (27° 34′ N. 51° 47′ W.).
200 M.W. ..... 1 *Bathophilus metallicus* (30 mm.).
300 M.W. ..... 1 *Eustomias obscurus* (72 mm.).
600 M.W. ..... 1 *Photonectes dinema* (23 mm.).
St. 1328. Atlantic (27° 05′ N. 52° 11′ W.).
1000 M.W. ..... 1 *Eustomias obscurus* (? mm.).
St. 1330. Atlantic (26° 37′ N. 54° 45′ W.).
500 M.W. ..... 1 *Eustomias tenisoni* (87 mm.).
1 *Photostomias guernei* (37 mm.).
600 M.W. ..... 1 *Photonectes dinema* (24 mm.).
St. 1332. Atlantic (26° 58′ N. 56° 58′ W.).
50 M.W. ..... 1 *Idiacanthus fasciola* (90 mm.).
200 M.W. ..... 1 *Bathophilus pawneei* (43 mm.).
300 M.W. ..... 1 *Echiostoma tanneri* (97 mm.).
2 *Photostomias guernei* (34 mm.).
400 M.W. ..... 1 *Idiacanthus fasciola* (245 mm.).
St. 1334. Atlantic (27° 28′ N. 59° 29′ W.).
200 M.W. ..... 1 *Eustomias obscurus* (66 mm.).
300 M.W. ..... 1 *Melanostomias menalopogon* (153 mm.).
1 *Idiacanthus fasciola* (65 mm.).
600 M.W. ..... 1 *Photonectes dinema* (24 mm.).
St. 1335. Atlantic (28° 02′ N. 62° 26′ W.).
300 M.W. ..... 1 *Bathophilus metallicus* (35 mm.).
1 — *chironema* (49 mm.).
2 *Eustomias obscurus* (70, 75 mm.).
1 — *bimargaritatus* (92 mm.).
1000 M.W. ..... 1 *Idiacanthus fasciola* (289 mm.).
St. 1337. Atlantic (29° 36′ N. 64° 01′ W.).
300 M.W. ..... 4 *Bathophilus metallicus* (35—70 mm.).
600 M.W. ..... 1 *Photostomias guernei* (58 mm.).
1000 M.W. ..... 1 — (73 mm.).
St. 1339. Atlantic, S. E. of Bermudas (30° 00′ N. 64° 38′ W.).
200 M.W. ..... 1 *Bathopilus metallicus* (55 mm.).
300 M.W. ..... 1 *Eustomias obscurus* (75 mm.).
St. 1341. Atlantic, W. of Bermudas (33° 15′ N. 68° 20′ W.).
150 M.W. ..... 1 *Bathophilus metallicus* (62 mm.).
200 M.W. ..... 1 — *chironema* (45 mm.).
1 *Leptostomias haplocaulus* (100 m.).

St. 1341. Atlantic, W. of Bermudas (33° 15′ N. 68° 20′ W.).

200 M.W.	1	*Photonectes intermedius* (50 mm.).
300 M.W.	1	*Bathophilus metallicus* (30 mm.).
600 M.W.	2	— *brevis* (15, 21 mm.).

St. 1342. Atlantic (34° 00′ N. 70° 01′ W.).

100 M.W.	1	*Bathophilus nigerrimus* (17 mm.).
	1	— *metallicus* (60 mm.).
150 M.W.	1	*Idiacanthus fasciola* (60 mm.).
200 M.W.	5	— — (58—120 mm.).
	1	*Chirostomias pliopterus* (33 mm.).
	1	*Echiostoma tanneri* (91 mm.).
	2	*Photonectes intermedius* (53, 54 mm.).
300 M.W.	3	— — (45—65 mm.).
	2	*Photostomias guernei* (38, 55 mm.).
1000 M.W.	1	— — (58 mm.).
2000 M.W.	1	— — (29 mm.).
4000 M.W.	1	*Malacosteus niger* (75 mm.).
4500 M.W.	1	— — (92 mm.).

St. 1345. Atlantic (35° 07′ N. 72° 38′ W.).

50 M.W.	1	*Aristostomias littmanni* (42 mm.).
100 M.W.	2	*Bathophilus metallicus* (26, 34 mm.).
150 M.W.	1	— — (25 mm.).
	1	*Eustomias obscurus* (113 mm.).
200 M.W.	3	*Photonectes intermedius* (47—70 mm.).
	4	*Idiacanthus fasciola* (52—220 mm.).
	1	*Photostomias guernei* (45 mm.).
300 M.W.	1	— — (27 mm.).
	2	*Idiacanthus fasciola* (72, 160 mm.).
1000 M.W.	1	— — (215 mm.).
	1	*Photostomias guernei* (101 mm.).

St. 1352. Atlantic (35° 42′ N. 73° 43′ W.).

150 M.W.	1	*Idiacanthus fasciola* (130 mm.).
200 M.W.	1	*Eustomias obscurus* (73 mm.).
	1	*Photostomias guernei* (48 mm.).
300 M.W.	1	*Eustomias simplex* (75 mm.).
	1	— *bibulbosus* (136 mm.).
	1	*Photonectes mirabilis* (18 mm.).
	2	*Idiacanthus fasciola* (170, 172 mm.).
	1	*Aristostomias lunifer* (40 mm.).

St. 1353. Atlantic (35° 51′ N. 66° 43′ W.).

50 M.W.	1	*Aristostomias littmanni* (40 mm.).
150 M.W.	1	*Bathophilus metallicus* (34 mm.).
	2	*Idiacanthus fasciola* (200, 209 mm.).
	2	*Photostomias guernei* (50, 53 mm.).
	1	*Aristostomias grimaldii* (56 mm.).
200 M.W.	2	*Bathophilus metallicus* (30, 31 mm.).
	1	*Echiostoma tanneri* (95 mm.).

St. 1353. Atlantic (35° 51′ N. 66° 43′ W.).

200 M.W.	1	*Idiacanthus fasciola* (65 mm.).
	2	*Photostomias guernei* (35, 38 mm.).
	1	*Aristostomias tittmanni* (48 mm.).
300 M.W.	1	*Leptostomias ramosus* (102 mm.).
	1	*Photonectes dinema* (29 mm.).
	1	— *intermedius* (51 mm.).
	3	*Photostomias guernei* (38—56 mm.).
1000 M.W.	1	*Bathophilus proximus* (55 mm.).

St. 1355. Atlantic (31° 48′ N. 63° 38′ W.).

200 M.W.	1	*Idiacanthus fasciola* (65 mm.).

St. 1356. Atlantic (29° 56′ N. 59° 33′ W.).

150 M.W.	1	*Bathophilus metallicus* (40 mm.).
	1	*Eustomias obscurus* (80 mm.).
200 M.W.	2	*Bathophilus metallicus* (40 mm.).
300 M.W.	1	— — (31 mm.).
600 M.W.	1	*Photonectes dinema* (25 mm.).
	1	*Idiacanthus fasciola* (50 mm.).

St. 1358. Atlantic (28° 15′ N. 56° 00′ W.).

300 M.W.	1	*Bathophilus metallicus* (31 mm.).
	1	*Photonectes ovibarba* (31 mm.).
	1	*Idiacanthus fasciola* (37 mm.).
	1	*Photostomias guernei* (33 mm.).
600 M.W.	1	— — (35 mm.).
1000 M.W.	2	*Photonectes parvimanus* (29, 33 mm.).
	1	*Eustomias monodactylus* (47 + mm.).
2000 M.W.	1	*Bathophilus metallicus* (28 mm.).
	1	*Eustomias bigelowi* (95 mm.).
	1	*Photonectes leucospilus* (28 mm.).
	1	— *intermedius* (56 mm.).
	2	*Photostomias guernei* (32, 45 mm.).
	1	*Malacosteus niger* (70 mm.).
3000 M.W.	1	*Photostomias guernei* (35 mm.).
7000 M.W.	1	— — (50 mm.).

St. 1360. Atlantic (26° 56′ N. 53° 09′ W.).

150 M.W.	1	*Echiostoma tanneri* (75 mm.).
	1	*Idiacanthus fasciola* (93 mm.).
200 M.W.	1	*Eustomias frondosus* (52 mm.).
300 M.W.	1	— *obscurus* (62 mm.).
600 M.W.	1	*Idiacanthus fasciola* (? mm.).
	1	*Photostomias guernei* (38 mm.).

St. 1361. Atlantic (27° 07′ N. 51° 10′ W.).

1000 M.W.	1	*Echiostoma tanneri* (96 mm.).

St. 1362. Atlantic (28° 57′ N. 47° 24′ W.).

300 M.W.	1	*Bathophilus metallicus* (33 mm.).
	1	*Eustomias obscurus* (80 mm.).

St. 1363. Atlantic (30° 25′ N. 44° 46′ W.).
300 M.W. . . . . 1 *Bathophilus metallicus* (37 mm.).
1000 M.W. . . . . 1 *Eustomias parri* (99 mm.).
St. 1365. Atlantic (31° 47′ N. 41° 41′ W.).
300 M.W. . . . . 1 *Eustomias obscurus* (57 mm.).
2000 M.W. . . . . 1 *Idiacanthus fasciola* (35 mm.).
3000 M.W. . . . . 1 *Bathophilus metallicus* (30 mm.).
1 *Photonectes parvimanus* (23 mm.).
4000 M.W. . . . . 1 *Idiacanthus fasciola* (35 mm.).
1 *Photostomias guernei* (30 mm.).
4500 M.W. . . . . 1 — — (40 mm.).
5000 M.W. . . . . 1 — — (35 mm.).
St. 1366. Atlantic (32° 30′ N. 40° 04′ W.).
300 M.W. . . . . 2 *Bathophilus metallicus* (30, 50 mm.).
1000 M.W. . . . . 1 — *longipinnis* (72 mm.).
1 *Melanostomias spilorhynchus* (206 mm.).
St. 1367. Atlantic (33° 42′ N. 36° 16′ W.),
300 M.W. . . . . 1 *Bathophilus metallicus* (83 mm.).
1000 M.W. . . . . 1 — — (35 mm.).
1 *Eustomias drechseli* (108 mm.).
1 *Photostomias guernei* (76 mm.).
St. 1368. Atlantic (34° 40′ N. 33° 16′ W.).
800 M.W. . . . . 1 *Bathophilus metallicus* (31 mm.).
1000 M.W. . . . . 1 — *brevis* (26 mm.).
1 *Melanostomias albibarba* (60 mm.).
St. 1369. Atlantic (35° 44′ N. 29° 33′ W.).
200 M.W. . . . . 1 *Bathophilus metallicus* (35 mm.).
St. 1370. Atlantic (36° 36′ N. 26° 14′ W.).
200 M.W. . . . . 1 *Bathophilus metallicus* (40 mm.).
800 M.W. . . . . 1 *Photostomias guernei* (97 mm.).
St. 1372. Atlantic (37° 23′ N. 26° 02′ W.).
200 M.W. . . . . 1 *Bathophilus metallicus* (40 mm.).
1000 M.W. . . . . 1 *Idiacanthus fasciola* (250 mm.).
3000 M.W. . . . . 1 *Eustomias furcifer* (138 mm.).
St. 1374. Atlantic (37° 40′ N. 26° 00′ W.).
800 M.W. . . . . 1 *Photostomias guernei* (96 mm.).
1000 M.W. . . . . 1 — — (90 mm.).
1 *Leptostomias ramosus* (180 mm.).
St. 1375. Atlantic (37° 33′ N. 25° 52′ W.).
600 M.W. . . . . 3 *Photostomias guernei* (36—80 mm.).
St. 1377. Atlantic (37° 40′ N. 26° 00′ W.).
100 M.W. . . . . 1 *Bathophilus metallicus* (35 mm.).
200 M.W. . . . . 1 *Flagellostomias boureei* (123 mm.).
300 M.W. . . . . 1 *Chirostomias pliopterus* (60 mm.).
1 *Bathophilus metallicus* (60 mm.).
600 M.W. . . . . 1 *Photostomias guernei* (75 mm.).
1000 M.W. . . . . 1 — — (104 mm.).

St. 1378. Atlantic (37° 44′ N. 25° 56′ W.).

200 M.W.	1	*Eustomias obscurus* (125 mm.).
	1	*Aristostomias tittmanni* (57 mm.).
300 M.W.	1	*Bathophilus nigerrimus* (36 mm.).
400 M.W.	1	*Melanostomias spilorhynchus* (90 mm.).

St. 1379. Atlantic (38° 02′ N. 25° 52′ W.).

200 M.W.	1	*Bathophilus metallicus* (53 mm.).
300 M.W.	1	*Idiacanthus fasciola* (160 mm.).
600 M.W.	1	*Photostomias guernei* (100 mm.).
1000 M.W.	2	— — (90, 105 mm.).

St. 1380. Atlantic (39° 26′ N. 21° 51′ W.).

800 M.W.	1	*Leptostomias ramosus* (170 mm.).

4. DISTRIBUTION

Vertical Distribution. The Stomiatidae and Malacosteidae seem mostly to live at no great depth below the surface. A great number of specimens were caught with nets fishing at 200 metres or less below the surface, and the hauls made with nets fished at greater depths did not differ much in character from those made nearer the surface, suggesting that many of the fish may have been caught when the nets were on their way up. No specimens of *Malacosteus* were taken in nets fished at less than 800 metres down (1600 metres of wire out) and the fishes of this genus may live at a greater depth than the others. There is evidence that post-larval *Idiacanthus* temporarily descend to depths of 1000 metres or more (see p. 132).

Distribution of Genera. Of the 19 genera of Stomiatidae (excluding *Stomias*) and Malacosteidae, all but one, *Opostomias*, described from a single specimen taken to the south of Australia, are known to occur in the North Atlantic. The new genera *Chirostomias*, *Trigonolampa*, *Thysanactis* and *Haplostomias* and the previously described *Flagellostomias*, *Grammatostomias*, *Lamprotoxus*, *Eustomias* and *Echiostoma* are so far known only from the Atlantic. One specimen from the Sandwich Islands is the only *Leptostomias* recorded outside the Atlantic, and one from Japan the only extra-Atlantic *Photonectes*. Genera represented in the Indian Ocean are *Bathophilus*, *Melanostomias*, *Idiacanthus*, *Photostomias* and *Malacosteus*. Three of these are known also from the Pacific coast of America, namely *Bathophilus*, *Idiacanthus* and *Malacosteus*. *Idiacanthus* is also recorded from the Pacific and Antarctic Oceans, and *Malacosteus* from the Philippines. *Pachystomias* is known from two specimens, each representing a distinct species, one from south of Australia, the other Atlantic. It may be supposed that after the intensive fishing of the "Dana" not many more genera of this group will be discovered in the North Atlantic and the Gulf of Panama, but it is probable that many genera that appear now to have a somewhat restricted distribution will prove to have a wider range when investigation of the other oceans is more thoroughly made.

Distribution of Species. In two ways the Stomiatidae and Malacosteidae agree with the Astronesthidae. One is that the few species known from the Indian Ocean mostly occur also in the Atlantic. *Borostomias braueri*, *Astronesthes cyaneus*, and *A. indicus* of the Astronesthidae, *Melanostomias melanops*, *M. valdviae*, and *Idiacanthus fasciola* of the Stomiatidae, and *Malacosteus niger* of the Malacosteidae, are common to the Atlantic and Indian Oceans. The second point of agreement is the small number of species taken in the Gulf of Panama, — two species of *Borostomias* in the Astronesthidae, *Bathophilus filifer* and *Idiacanthus panamensis* in the Stomiatidae, and *Malacosteus danae* in the Malacosteidae, these are all

specifically distinct from their Atlantic allies, and the *Idiacanthus* also from species occurring off California and off Chile. The paucity of species of Stomiatoids in the Gulf of Panama contrasts with the much larger number of species of a much smaller group, the Ceratioids, known from that region. *Aristostomias*

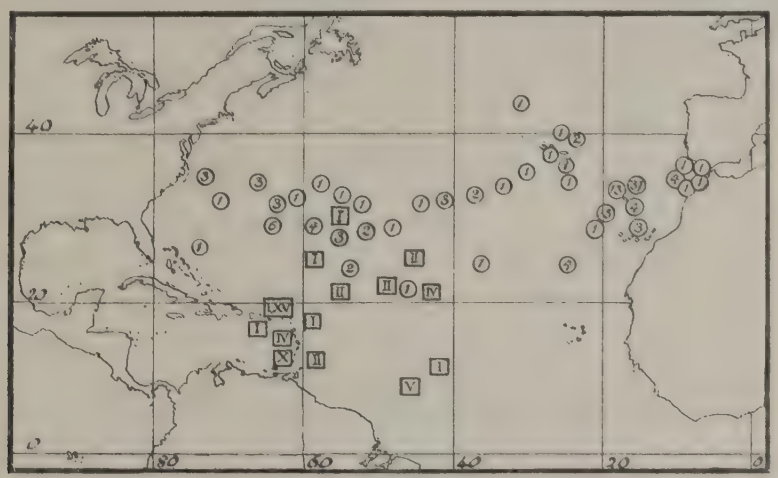


Fig. 1. Distribution of *Bathophilus metallicus* and *B. pawneei*. The approximate position of the "Dana" stations at which *B. metallicus* was caught is shown by circles, and the number of specimens taken by Arabic figures inside the circles. For *B. pawneei* the stations and the number of specimens are shown by squares with Roman numerals inside them.

was not taken in the Gulf of Panama, but a species has been described from off California. Except *Stomias*, the only Stomiatid known from the Mediterranean is *Bathophilus nigerrimus*; this is now found not to be peculiar to that sea, but to range right across the Atlantic to the Gulf of Mexico and the Caribbean Sea.

A considerable proportion of the species are known from a single specimen, or from two or three specimens only. It is impossible to say anything about the distribution of such species, but those that are

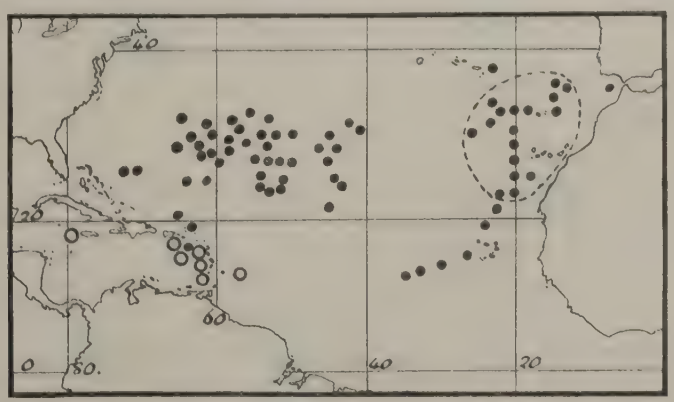


Fig. 2. Distribution of *Eustomias obscurus* and *E. variabilis*. "Dana" stations shown by solid spots for *E. obscurus* and circles for *E. variabilis*. Of 193 specimens of *E. obscurus* 103 were taken within the area enclosed by a dotted line.

more abundant have some interest. *Chirostomias pliopterus* extends right across the Atlantic north of 20° N., whereas *Thysanactis dentex* inhabits the Caribbean Sea and the Atlantic south of 20° N and west of 35° W. In several genera there are some species that resemble *Chirostomias* in their distribution and others with the distribution of *Thysanactis*. In *Bathophilus*, for example, the two most abundant species are *Batho-*

philus metallicus and *B. pawneei* (fig. 1). *B. metallicus* is a northern species; it ranges across the Atlantic North of 20° N., but nearly half the specimens taken by the "Dana" were captured near Madeira and the Canaries. *B. pawneei* occurs in a region mainly south of that occupied by *B. metallicus*, and west of 40° W. Of 101 specimens taken by the "Dana" 83 were caught near the lesser Antilles.

In *Eustomias* the common species of the genus north of 20° N. and in the east is *E. obscurus*

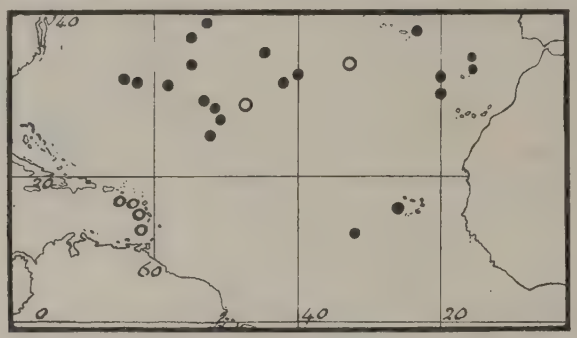


Fig. 3. Distribution of *Melanostomias spilorhynchus* and *M. albibarba*.
"Dana" stations at which *M. spilorhynchus* was taken indicated by solid spots; stations of *M. albibarba* shown by circles.

(fig. 2). Of 193 specimens caught by the "Dana" 103 are from the Madeira—Canaries region, some were taken near the Cape Verde Islands, and only one in the Caribbean Sea. *Eustomias enbarbatus* and its allies (*Haploclonus*) and also *E. frondosus* appear to have a similar distribution, but a number of other species, e. g. *E. variabilis* (fig. 2), *E. brevibarbatus*, *E. dubius*, *E. polyaster*, *E. micraster*, etc. are restricted to the Caribbean Sea and neighbouring parts of the Atlantic.

Melanostomias spilorhynchus (fig. 3) has the distribution of *Eustomias obscurus*, but several other species of *Melanostomias* appear to be mainly Antillean.

The species mentioned above point to the conclusion that temperature and currents may influence

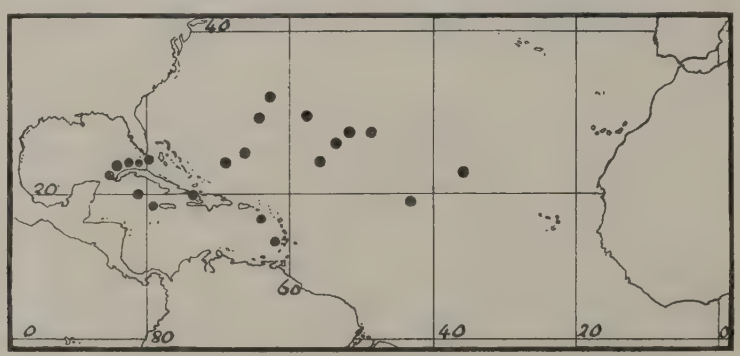


Fig. 4. Distribution of *Echiostoma tanneri*. "Dana" stations shown by spots.

the distribution of some Stomiatoids, the extension southwards of some of the more northerly species in the east corresponding to the southward trend of the North Atlantic Drift.

There are, however, other species with a different type of distribution, for example *Echiostoma tanneri* (fig. 4), which is a western species, but extends northwards beyond 30° N. 92 specimens were taken by the "Dana" in the Caribbean Sea, the Gulf of Mexico, and the Atlantic, all but one west of 40° W.

Photostomias guernei (fig. 5) is widely distributed. *Flagellostomias boureei* has a similar distribution,

as has *Bathophilus nigerrimus*, except that it occurs also in the Mediterranean. *Bathophilus brevis* and *B. longipes* are two more examples of widely distributed species; the former was taken in mid-Atlantic (30° N. 50° W.), and also near Bermuda, off French Guiana, and west of the Cape Verde Islands.

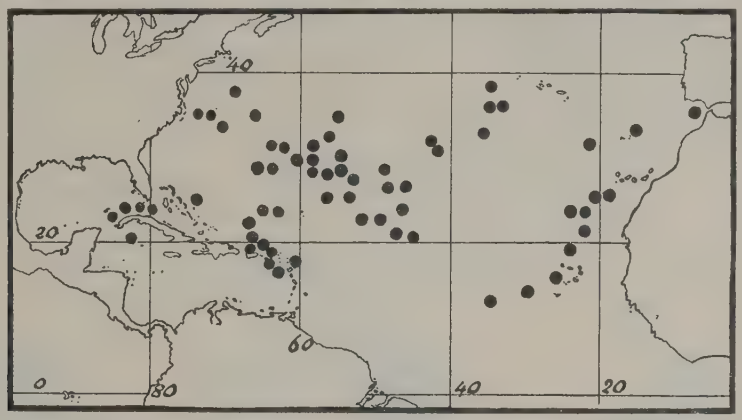


Fig. 5. Distribution of *Photostomias guernei*. "Dana" stations shown by spots.

5. STRUCTURE AND CLASSIFICATION

As already stated in our report on the Astronesthidae and Chauliodontidae the name "Stomiatoid" may be given to a group of oceanic fishes belonging to the order Isospondyli, distinguished from the Clupeoids and Salmonoids by the presence of photophores, which are typically arranged in a double series along each side of the lower part of the body, and a single series on the tail.

The Stomiatoids include six families, two of which, the Gonostomatidae and Sternoptychiidae, are distinguished by the well-developed parietals, the presence of gill-rakers, two supplemental maxilliaries, the absence of a postocular luminous organ and of a barbel, etc., whereas the other four families, Astronesthidae, Chauliodontidae, Stomiatidae, and Malacosteidae, have in common that the serial photophores have no lumen or duct, the parietals are either small and well-separated or are absent, there are no gill-rakers but the gill-arches often bear teeth, there is typically a pointed ascending process formed by anterior expansions of the praemaxilliaries, a postocular luminous organ is present, and a barbel is generally present.

In the Stomiatidae and Malacosteidae, as in the Astronesthidae and Chauliodontidae, there is no orbitosphenoid and no opisthotic, the basisphenoid is stout and supports the wing-like alisphenoids, the praeoperculum is slender, and the entopterygoid is either membranous or very thinly ossified.

The vertebral centra are thin cylinders of bone enclosing the notochord; the parapophyses and at least the anterior neural arches are not ankylosed with the centra; the parapophyses bear pleural ribs and sometimes epipleurals; epineurals are present. In *Thysanactis*, *Leptostomias* and *Eustomias* of the Stomiatidae, and in the Malacosteidae, there are remarkable modifications of the anterior vertebrae.

The alimentary canal of the Stomiatidae and Malacosteidae is very similar to that of the Astronesthidae. There is a long caecal stomach, generally pigmented; anteriorly it gives off a short narrow arm that opens into the intestine, which is generally straight; typically there are two pyloric caeca.

Two muscles are attached to the cerato-hyal, which seem to correspond to Edgeworth's[1] *intermandibularis posterior* and *interhyoideus*. The *intermandibularis* is attached anteriorly to the lower jaw near its symphysis, and the *interhyoideus* is the muscle of the barbel, generally forking anteriorly when the barbel is stout.

[1] Phil. Tr. R. Soc. B. CCVII, 1928, p. 61.

Family STOMIATIDAE.

In this family we include those Stomiatoids in which the dorsal and anal fins end at a short distance from the caudal, and a membrane connects the lower jaw with the hyoid arch.

Stomias is distinguished from the other genera especially by two features, one primitive, the presence of scales, and the other in this group a specialized character, the praemaxillaries free from the maxillaries. In other respects, and especially in cranial osteology, *Stomias* is rather similar to the new genus *Chirostomias*, which is more specialized than *Stomias* in being scaleless, but more generalized in having an adipose fin, a post-temporal bone, and a straight cleft to the mouth. The skull of *Stomias* (fig. 6, A) differs from that of the Astronesthidae and resembles that of *Chauliodus* in that the frontals do not extend backwards on each side of the supraoccipital and the epiotics appear on the upper surface; it differs from

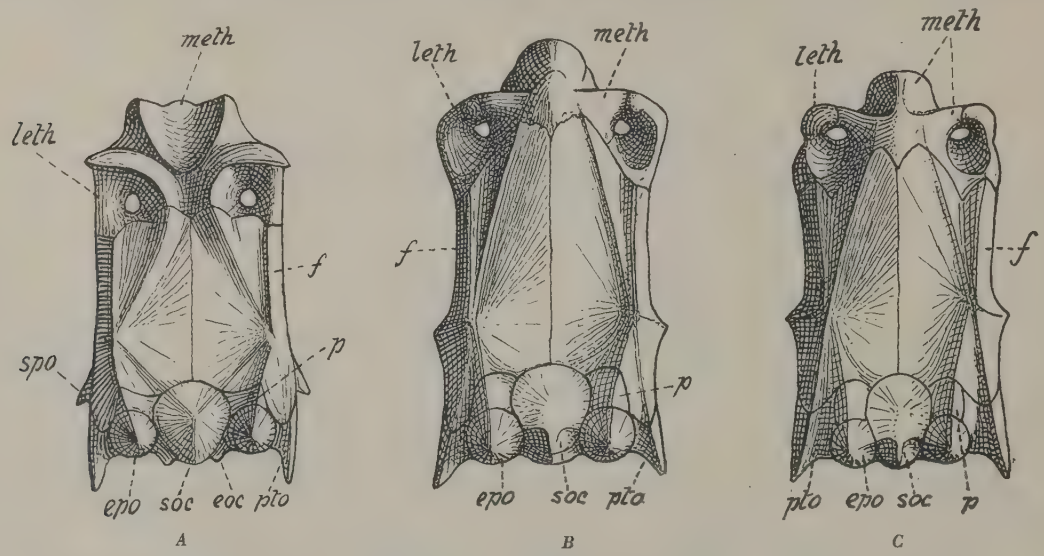


Fig. 6. Upper view of skulls of *A. Stomias boa*; *B. Chirostomias pliopterus*; *C. Trigonolampa miriceps*.
eoc. exoccipital; *epo.* epiotic; *f.* frontal; *leth.* lateral ethmoid; *meth.* mesethmoid; *p.* parietal; *pto.* pterotic; *soc.* supraoccipital.

that of *Chauliodus* in having well-developed, although small, parietals. In these features *Stomias* resembles *Chirostomias* (fig. 6, B) and the resemblance extends also to the position of the principal ridges. Distinctive of *Stomias* is the very large mesethmoid, with a triangular depression, for the reception of the praemaxillary pedicels, on the broad median projection, and with a strong pair of ridges curving outwards in front of the nasal sacs.

Chirostomias and ***Trigonolampa***. These closely related genera differ from all other Stomiatidae in having the pectoral arch attached to the skull by a post-temporal bone. They are moderately elongate in form, with the dorsal and anal fins subequal and opposed, and with the pelvics inserted nearly in the middle of the length. The cleft of the mouth is straight, the fangs in the jaws are fixed, there is a pair of teeth on the vomer and a long series on each palatine, extending on to the ectopterygoid. The praemaxillaries have anterior projections that together form a rather small pointed ascending process; a supplemental maxillary is present; the palatine is internal to the maxillary, and ends anteriorly in a slightly expanded cartilaginous head which is attached by ligament to the vomer. Parietal bones are present, and the anterior ends of the lateral ethmoids curve inwards to unite with the stout lateral processes of the mesethmoid.

In *Chirostomias* the vertebral column is as in *Astronesthes*, the first centrum articulating with the

skull; the hyoid muscles (fig. 7, B) are arranged as in *Heterophotus*; both arise from the lower part of the ceratohyal; the interhyoid lies outside the intermandibular and originates behind it. It may be noted that *Astronesthes* is similar, but has the muscles inserted nearer the upper end of the ceratohyal (fig. 7, A). The intestine of *Chirostomias* is straight and has a pair of pyloric caeca (fig. 8, B).

Opostomias. This genus agrees with the two preceding ones in form, and in the structure and position of the fins, except that the pectoral has an isolated and produced ray. The jaws are strong; the first tooth in the lower jaw is a strong fixed fang that pierces the praemaxillaries, and the second in the

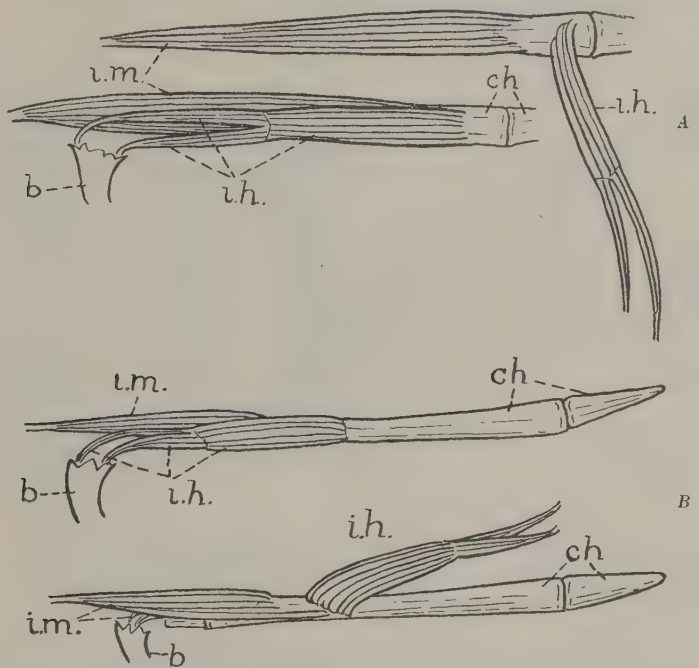


Fig. 7. Hyoid muscles of A. *Astronesthes indicus* and B. *Chirostomias pliopterus*.
b. barbel: *ch.* cerato-hyal; *i. h.* interhyoid muscle; *i. m.* intermandibular muscle; In the upper figure of "A" and the lower of "B" the interhyoid is cut and turned back.

upper jaw is a similar fang; behind these are 2 or 3 small fixed teeth and one inner depressible tooth. The vomer has a pair of small teeth; the palatines are toothless. The praemaxillaries form a strong pointed ascending process. Parietal bones are present, but the skull (fig. 9, A) differs from that of *Chirostomias* in the ethmoid region; the lateral processes of the mesethmoid that join the lateral ethmoids are smaller and come off from about the middle of the height of the broad median process. At the anterior end of the intestine is a pouch with a single caecum.

Flagellostomias. This genus is closely related to *Opostomias*, but differs in the more elongate form, the more posterior pelvics, and the longer anal fin. The dentition is similar, except that the lower fangs do not pierce the praemaxillaries, but fit into a groove on the outside of the upper jaw between the first and second teeth, and that 1 or 2 teeth are present on each palatine. The skull (fig. 9, B) differs from that of *Opostomias* in the ethmoid region, for the median projection is narrow, and the lateral processes that unite with the lateral ethmoids are strong, and are on a level with the upper surface of the skull. The first centrum is separated from the skull by the notochord for a distance as long as a centrum; its neural arch is enlarged and directed forwards (fig. 12, A). As there are two spinal nerves in front of it this vertebra is probably the second, the first being absent. The intestine has an anterior pouch, but no caecum (fig. 8, D).

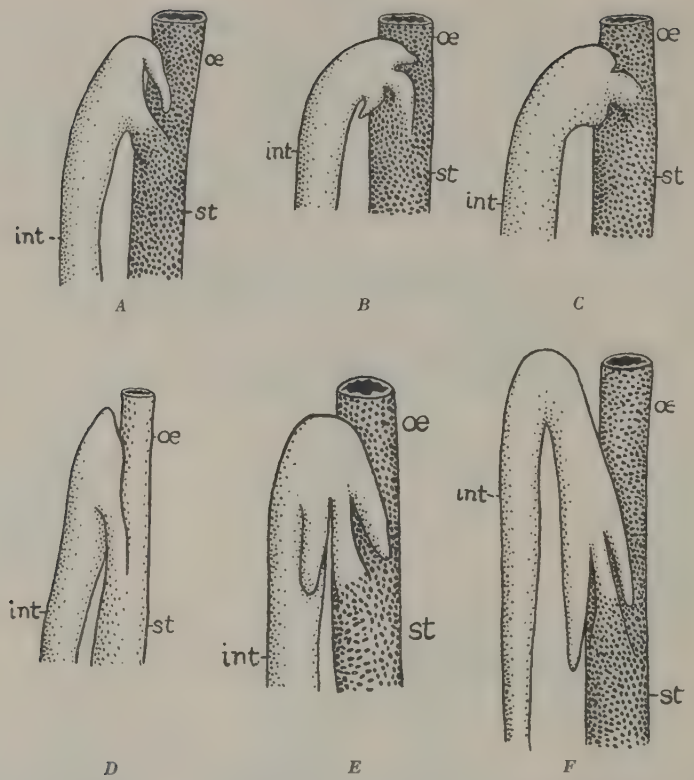


Fig. 8. Anterior part of gut of *A. Thysanactis*; *B. Chirostomias*; *C. Pachystomias*; *D. Flagellostomias*; *E. Idiacanthus*; *F. Eustomias*. *int.* intestine; *œ.* œsophagus; *st.* stomach.

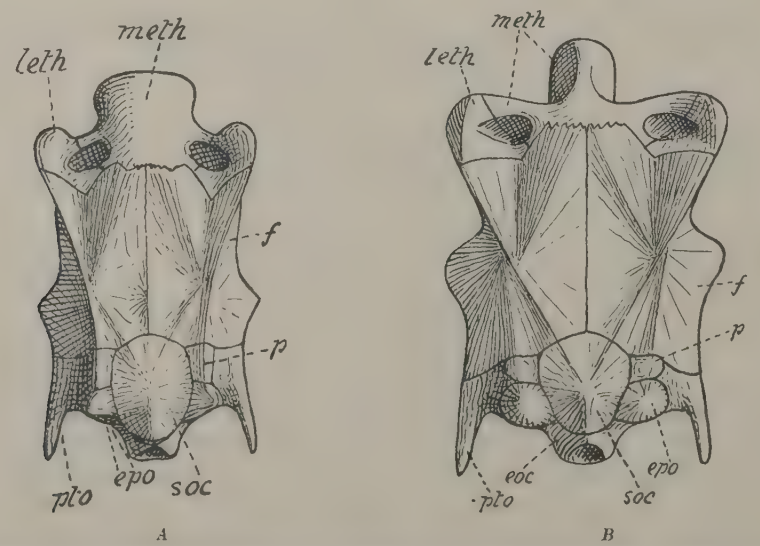


Fig. 9. Upper view of skulls of *A. Opostomias micripnus*; *B. Flagellostomtas boureei*. Lettering as in fig. 6.

Thysanactis and ***Leptostomias.*** These are elongate, with posterior pelvic fins. *Thysanactis* has an isolated and produced pectoral ray, and the anal fin longer than the dorsal, whereas *Leptostomias* has no isolated ray and subequal dorsal and anal fins. The dentition af both genera is nearly that of *Flagellostomias,* except that the upper fang is depressible. In *Thysanactis* the median process of the praemaxillaries is smaller than in *Opostomias* and *Flagellostomias,* and a flange has developed on each side of it; in *Leptostomias* the median process is absent, and the flanges are larger. In both genera parietals are present, the mesethmoid is broad, and the lateral processes that come off from near its base are small club-shaped cartilages that meet, but do not unite with, the anterior ends of the lateral ethmoids.

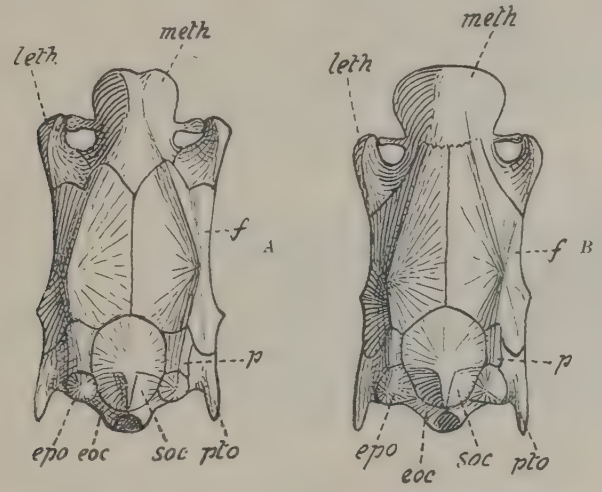


Fig. 10. Upper view of skulls of *A. Thysanactis dentex*; *B. Leptostomias ramosus.* Lettering as in fig. 6.

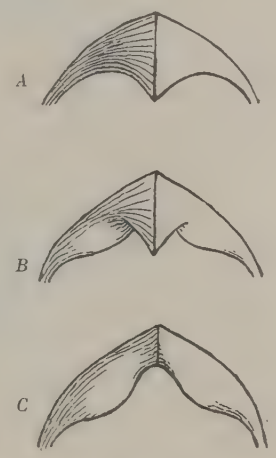


Fig. 11. Upper view of anterior part praemaxillaries in *A. Flagellostomias*; *B. Thysanactis,* and *C. Leptostomias.*

The vertebral column in both genera is highly specialized; that of *Thysanactis dentex* is essentially similar to that of *Leptostomias ramosus* (fig. 12, B), which is here described. The first centrum is that of the eighth vertebra; in front of it the notochord has a slight downward curve and bears six pairs of parapophyses below and seven paired neurapophyses above; the first neural arch is represented by a pair of small bones that articulate with the exoccipital; the next neurapophysis is large and meets its fellow above, and is succeeded by six that are broader than those behind them. The acentrous condition of the anterior part of the vertebral column probably gives great flexibility to this region, perhaps necessary if the head is moved violently in seizing prey; but why more necessary in these two genera than in *Flagellostomias* is hard to say. The alimentary canal of both genera is like that of *Opostomias,* the intestine having an anterior pouch with a caecum (fig. 8, A). The hyoid muscles of *Leptostomias* are similar to those of *Chirostomias,* except that they are inserted nearer the upper end of the lower segment of the cerato-hyal.

The four genera with parietals but without a post-temporal, namely *Opostomias, Flagellostomias, Thysanactis,* and *Leptostomias,* form a natural group defined by characters of the skull, teeth, and intestine. *Leptostomias* is the most specialized of the four in most respects, but is more generalized than *Thysanactis* in the structure of the fins. The resemblance between these two in other characters is so close that we infer that the isolated pectoral ray and long anal fin of *Thysanactis* are misleading in indicating affinity to *Flagellostomias,* and have been acquired independently.

Grammatostomias, Lamprotoxus and ***Bathophilus.*** In the remaining genera of the Stomiatidae parietals are absent. Of these *Grammatostomias,* which we have not seen, appears to differ from *Lamprotoxus* only in the absence of a loop of luminous tissue on the anterior part of the body. These genera agree

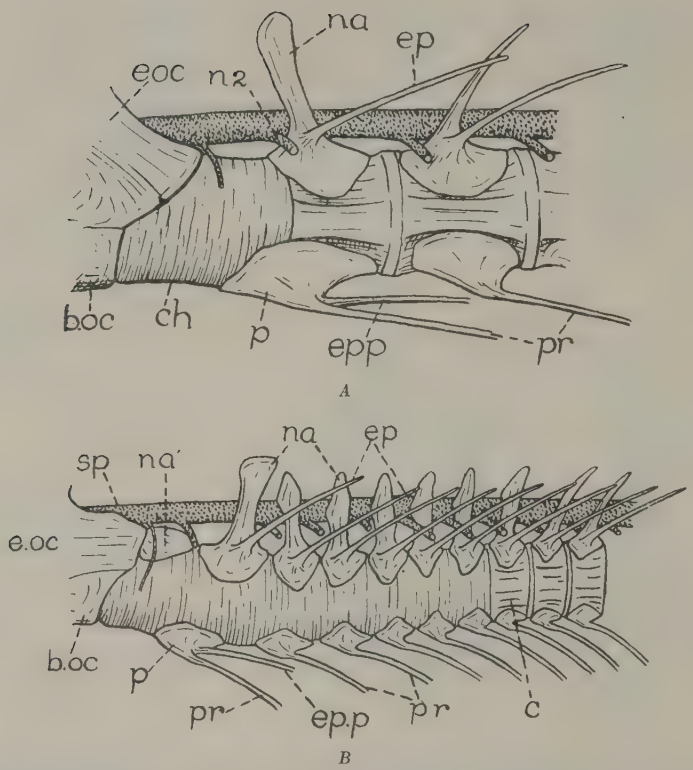


Fig. 12. Lateral view of anterior end of vertebral column and spinal cord of *A. Flagellostomias boureei; B. Leptostomias ramosus.* *boc.* basioccipital; *c.* centrum; *ch.* notochord; *eoc.* exoccipital; *ep.* epineural; *epp.* epipleural; *n2.* second spinal nerve; *na.* neural arch; *p.* parapophysis; *pr.* pleural rib.

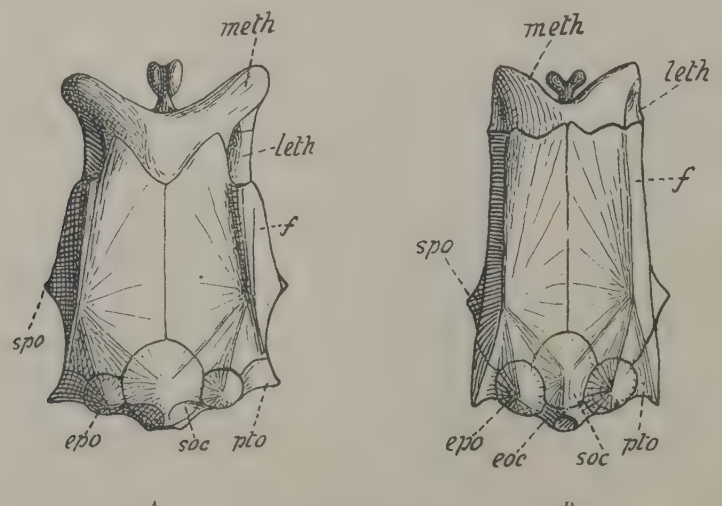


Fig. 13. Upper view of skull of *A. Lamprotoxus flagellibarba*; *B. Bathophilus metallicus.* Lettering as in fig. 6.

with *Chirostomias* in form, and in the structure and position of the fins, but differ in the dentition. The first praemaxillary tooth is of moderate length and fixed, the second is very long and depressible; behind these are a few smaller teeth, alternately fixed and depressible; in the lower jaw the first tooth is very long and fixed; behind it are one or two small outer fixed teeth, and an inner series of depressible teeth. The vomer is toothless, and the palatine teeth are few. The skull of *Lamprotoxus* (fig. 13, A) differs from that of the genera previously described in the absence of parietals and in the structure of the ethmoid region;

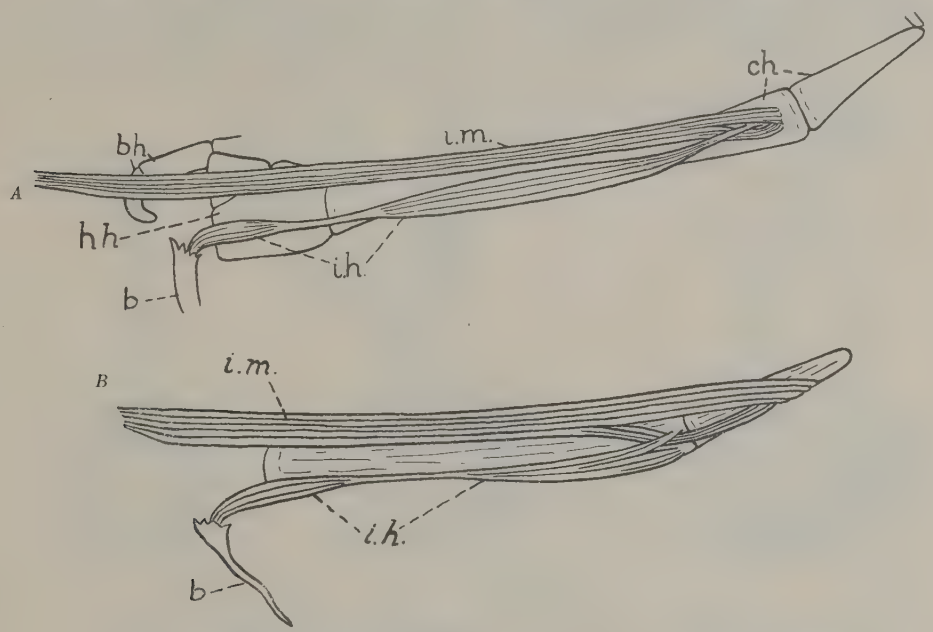


Fig. 14. Hyoid muscles of *A. Bathophilus metallicus*; *B. Pachystomias microdon*.
b. barbel; *bh.* basihyal; *ch.* ceratohyal; *hh.* hypohyal; *i.h.* interhyoid muscle; *i.m.* intermandibular muscle.

the mesethmoid has a very narrow median projection that extends downwards and forwards to the head of the vomer and very broad lateral processes that extend outwards in front of the parallel lateral ethmoids. The anterior end of the palatine is considerably expanded and intervenes between the upper jaw and the lateral process of the mesethmoid, to both of which it is attached; the supplemental maxillary, ovate in form and firmly attached to the maxillary in the preceding genera, is in *Lamprotoxus* long and tapering, rather loosely attached to the maxillary, but with its expanded posterior end articulating with the lower jaw.

As will be seen from the figures (fig. 13) the skull of *Bathophilus*, a curious genus distinguished by the lateral pelvic fins, is extremely similar to that of *Lamprotoxus*. The dentition is also the same, except that the teeth are smaller, and the palatine and supplemental maxillary have the same peculiarities. The close relationship of *Bathophilus* to *Lamprotoxus* is evident.

In *Bathophilus* there are two spinal nerves in front of the first ossified vertebra, which is preceded by a fibrous ring enclosing the notochord; it may be inferred that the true first vertebra is absent.

In *Bathophilus* the hyoid muscles (fig. 14, A) originate at the upper end of the lower segment of the ceratohyal; the interhyoid has two bellies, and its tendon passes through a loop in the intermandibular muscle. This arrangement may have been derived from that of *Chirostomias* by the shifting back of the attachment of the intermandibular muscle above and below that of the interhyoid.

In both *Lamprotoxus* and *Bathophilus* the alimentary canal is as in *Chirostomias*, the intestine being straight, with two pyloric caeca (fig. 8, B).

Pachystomias, which agrees well enough with *Lamprotoxus* in the structure and position of the fins, is distinguished by the small fixed teeth, and by the presence of a large glandular subocular organ with two luminous surfaces. From Günther's description of a fold of skin behind the symphysis, Parr has inferred the absence of any other connection between the two halves of the lower jaw, but this is erroneous, the connecting membrane and muscles between lower jaw and hyoid being developed exactly as in other Stomiatidae.

In the form and relative position of the mesethmoid and lateral ethmoids, etc., the skull of *Pachystomias* shows some resemblance to that of *Lamprotoxus,* although it differs in its more elongate form

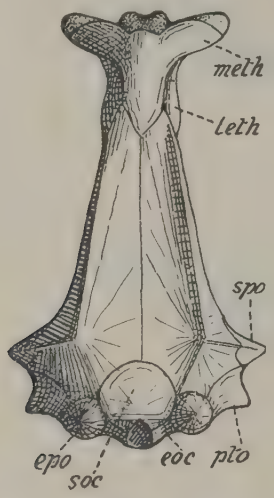


Fig. 15. Upper view of skull of *Pachystomias microdon.* Lettering as in fig. 6.

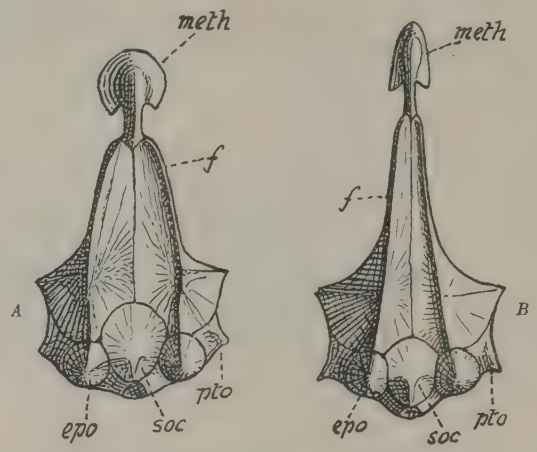


Fig. 16. Upper view of skull of A. *Eustomias frondosus*; B. *Eustomias obscurus.* Lettering as in fig. 6.

and in the narrowing forward of the frontals. The anterior end of the palatine is expanded as in *Lamprotoxus,* but the supplemental maxillary, although more elongate than in *Opostomias* etc. is firmly attached to the maxillary.

The hyoid muscles of *Pachystomias* (fig. 14, B) are like those of *Bathophilus,* except that the intermandibular is inserted mainly on the upper segment of the cerato-hyal, and only a part of the interhyoid goes through the loop. The pyloric caeca are reduced to a pair of pouches (fig. 8, C).

Eustomias is an isolated genus, distinguished by the protractile upper jaw, and by having the anal fin considerably longer than the dorsal. The teeth in the jaws exhibit considerable diversity in the different species, but generally behind the anterior fangs there are outer fixed and inner depressible teeth; the palate is toothless. The skull is rather similar to that of *Pachystomias* except in the ethmoid region, the lateral ethmoids being absent, and the lateral projections of the mesethmoid being laminar and meeting in front. The much expanded anterior end of the palatine is firmly attached to the upper jaw, and is loosely connected by ligament with the laminar part of the mesethmoid; the slender ectopterygoid is firmly attached posteriorly to the maxillary, and a ligament connects its hind end with the quadrate. The loose attachment of the palatine in front and the ectopterygoid behind permit their movement forward and backward, and that of the upper jaw which is rigidly connected with them.

We have examined the anterior end of the vertebral column in nine species of *Eustomias,* representing six subgenera.

The first two vertebrae are unossified; behind the third spinal nerves is a pair of broad neura-

pophyses that meet above; the notochord then bends to form a ventrally convex loop, including anteriorly a centrum that seems to belong to the neural arch in front of it; behind the loop are four pairs of strong neurapophyses, belonging to the sixth to ninth vertebral segments, united to each other by ligaments;

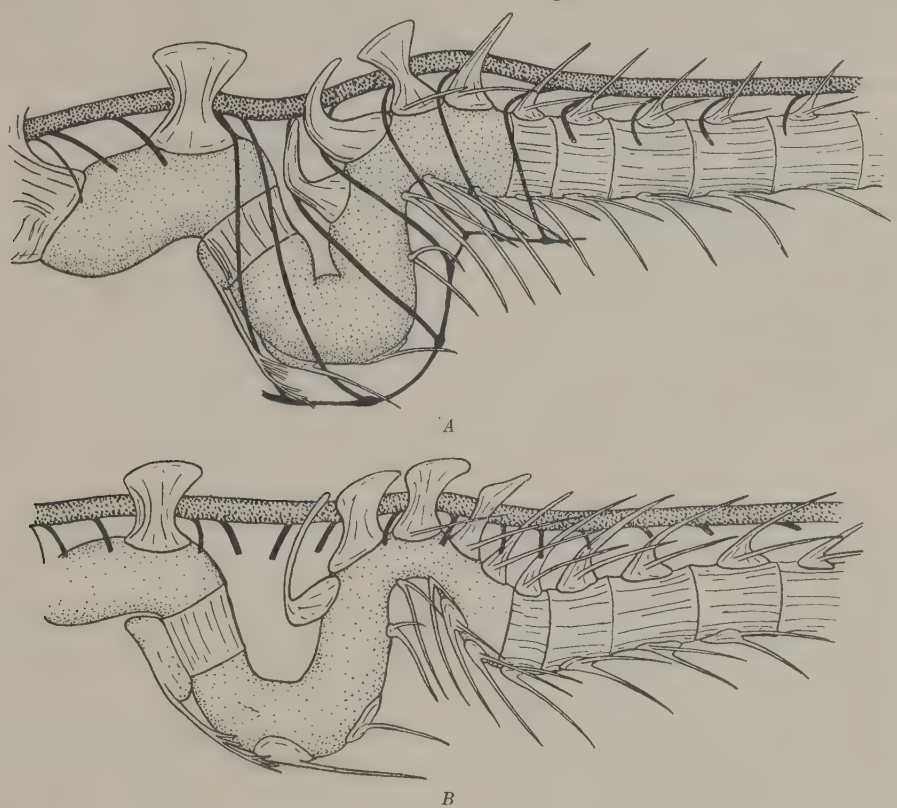


Fig. 17. Lateral view of anterior end of vertebral column and spinal cord of *A. Eustomias fissibarbis*; *B. E. brevibarbatus.*

there may be a second downward bend of the notochord, and the first complete vertebra, which has a very short centrum, is the tenth or eleventh; this is succeeded by normal vertebrae.

Three types may be distinguished:—

A. No well defined second loop. Six acentrous vertebrae behind the first centrum, all with ribs.
B. A larger anterior and smaller posterior loop. Seven acentrous vertebrae behind the first centrum, all with ribs.
C. Two loops, the posterior nearly as large as the anterior. Seven vertebrae between the first centrum and the first normal vertebra, the third to fifth without ribs.

Type A. This is found in *E.* (*Spilostomias*) *stigmatopleura*, *E.* (*Haploclonus*) *enbarbatus*, *E.* (*Dinematochirus*) *frondosus*, *E.* (*Dinematochirus*) *fissibarbis* (fig. 17, A) and *E.* (*Achirostomias*) *dactylobolus.*

A specimen of *E. fissibarbis* may be described as typical. The positions of the vertebrae relative to the spinal nerves and their branches communicating with the sympathetic chain have been used in determining to what segments the parts of incomplete vertebrae belong (fig. 17, A). The first and second spinal nerves have no corresponding vertebrae. The broad first neural arch is placed on the notochord and its centrum is behind it in the first part of the bend, and bears a fairly large pair of parapophyses, which appear cartilaginous but may be weakly ossified; from these arise a pair of pleural ribs, branched distally, and

lying just in front of the *ramus communicans* of the fourth spinal nerve. From this fact and by counting the pleural ribs forwards from the first typical vertebra, it is inferred that the first centrum belongs to the segment between the third and fourth spinal nerves, and therefore to the first neural arch. The two segments at the base of the bend have each a pleural rib arising from a low parapophysis. The next four neurapophyses, behind the sixth to ninth spinal nerves, are strong and are bound together by fibrous tissue to form a broad support for the muscle connecting them to the skull. The first two of these are strongly curved backwards and have no epineurals, the third is expanded distally and bears an epineural, and the fourth is like the succeeding neurapophyses in shape. Corresponding to each of these neurapophyses is a minute parapophysis, bearing a pleural rib and an epipleural. The tenth spinal nerve emerges in front of the slender neurapophysis of a vertebra, which is typical, except that its centrum is very short. The succeeding centrum is longer, and the next is of the length characteristic of the trunk region of the fish, in which the neural arches and pleural bones are short and slender.

The other species exhibiting this type of column differ in detail from *E. fissibarbis*. In *E. frondosus*, the first epineural is on the second of the four connected neurapophyses, and in *E. dactylobolus* and *E. enbarbatus* on the first of these. The third of the connected neurapophyses is but slightly expanded in *E. frondosus*, and not at all in *E. enbarbatus*, differences in shape that may perhaps be individual, or due to age. In *E. frondosus* no epipleural could be detected in the segment of the sixth spinal nerve.

Type B. This type (fig. 17, B) is exemplified by *E. brevibarbatus*, *E. bimargaritatus* and *E. polyaster*, of the sub-genus *Nominostomias*. They differ from *E. fissibarbis* in having an additional vertebra acentrous, and in the great enlargement of the first pair of parapophyses, which are united to each other and are produced forwards and upwards to form a grooved support for the anterior part of the notochord. The neurapheses of the sixth and seventh vertebrae are more specialised than in Type A. That of the sixth is sharply curved, with a broad proximal limb and a distal limb that is slender and is flattened anteroposteriorly, forming the anterior edge of the crest-like structure composed of the four connected neurapophyses. The first epineural is borne by the neurapophysis of the eighth vertebra, as in *E. fissibarbis*. The parapophyses at the base of the first bend are associated with small ossifications on the notochordal sheath.

Type C. This type is exemplified by *E. obscurus*. The first parapophysis is enlarged as in type B, but its pleural rib is smaller, and in the specimens examined is simple. There are no epineurals on the acentrous vertebrae, and underneath the posterior loop three pleural ribs with their epipleurals have disappeared. The first of these segments without pleural ribs is that of the sixth spinal nerve. The parapophyses of this segment are well developed and are attached to an ossification that probably represents a centrum; it extends round the notochord to the base of the neural arch in one specimen, and forms a complete ring in another. The parapophyses of the two preceding segments are associated with smaller ossifications, that may therefore be interpreted as incomplete centra.

These eccentricities of structure in *Eustomias* are doubtless related to the violent movements of the head involved in protraction of the jaws and wrestling with large prey. A comparison of fig. 18, B, drawn from a specimen with the mouth closed and upper jaw retracted, with fig. 18, A, drawn from a specimen with jaws strongly protracted and mouth open, shows that the bends can be opened out to an extent, the limit of which is shown by the straightness of the spinal cord in fig. 18, B. When the mouth is closed the spinal cord is slack, and as is well shown in fig. 17, A of *E. fissibarbis*, the spinal nerves of this region run forwards to emerge in front of their neurapophyses and turn back again to supply their respective segments. Thus the bent, incompletely ossified region gives flexibility and acts as a shock absorber; also the opening out and closing up of the bends, and corresponding movements of the jaws, may assist in swallowing prey. The explanation of the enlarged neural arches is found in the specialisation of the

upper part of the lateral muscle (fig. 19, C). This is attached to the epiotic and neighbouring bones of the skull in two portions, an inner and dorsal, and an outer. The first originates from the epiotic as a tendon from which a muscle segmented into four parts passes back over the first neurapophysis, attached partly to it, and partly to ligaments supported by the neurapophysis and running from it to the first centrum, to the next incomplete centrum, and to the notochord at the base of the bend. The outer muscle represents parts of the myotomes of several (7 to 9) segments, but it is difficult to count them, as the myosepta

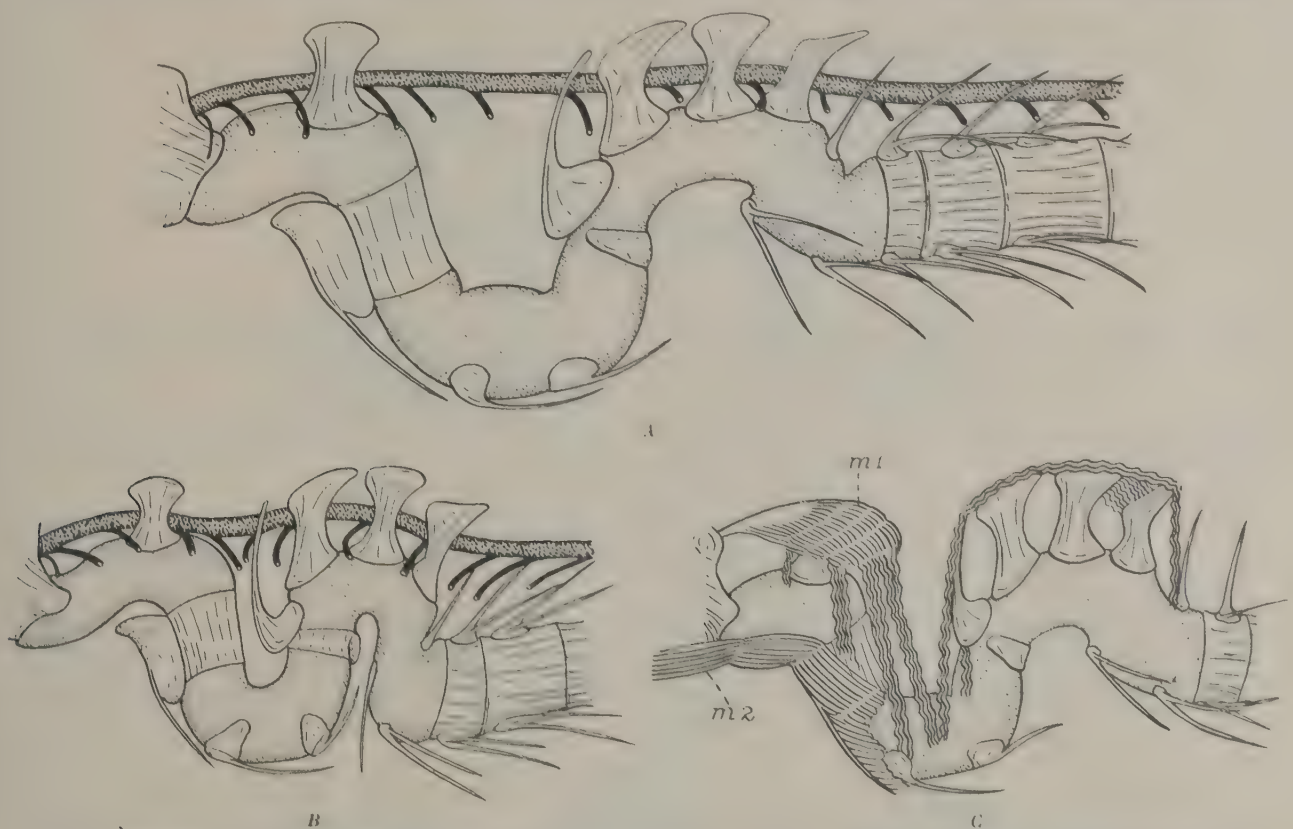


Fig. 18. *Eustomias obscurus*. Anterior part of vertebral column and spinal cord of *A*. specimen with upper jaw protracted; *B*. specimen with upper jaw retracted. *C*. Anterior part of vertebral column, with main ligaments shown by wavy lines; m_1 muscle from epiotic; m_2 muscle from parasphenoid.

are very thin and weak, and the muscle acts as a unit attached at one end to the skull and at the other to the structure formed by the four neural arches and the ligaments and fibrous membrane uniting them. Behind and below, the muscle passes insensibly into the typical segmented myotomes. Fig. 18, C, shows the first muscle and the main ligaments, but these are for the most part merely specialised tracts in a mass of fibrous tissue binding the four neural arches together. It has been drawn from a specimen of *E. obscurus*, but the structure is the same in the other types. It may be noted that no ligament crosses the trough of the bend.

The enlargement of the first parapophyses is probably related to the fact that the muscle attached anteriorly to the parasphenoid, though it is interrupted by a myoseptum attached to the anterior end of the notochord, finds its first bony support on these parapophyses.

The 57 mm. *Eustomias obscurus* from St. 1365, with juvenile characters (p. 82, fig. 59), has been examined. On the unossified notochord behind the third spinal nerve there is a cartilaginous neural arch,

broad above and below as in the adult, and already supporting the dorsal part of the first two myotomes (fig. 19, A and B). Below it are a pair of small cartilaginous nodules, no doubt representing the enlarged parapophyses. Behind this the notochord is slightly curved ventrally and two neural arches are missing. The rudiments of the four connected neural arches are simple conical cartilages, and the fibrous tissue round them is not much stronger than that in front and behind. The posterior neurapophyses are similar to these but smaller. The structure of some of the neural arches in the adults, considered in re-

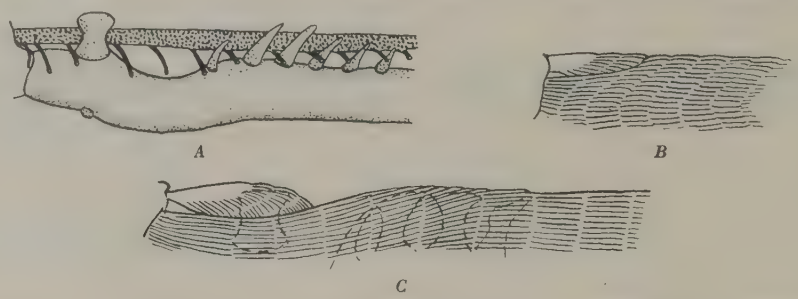


Fig. 19. *Eustomias obscurus*. *A*. anterior part of vertebral column and spinal cord of young fish. *B*. muscles attached to anterior vertebrae of young fish. *C*. muscles of adult (the neural arches shown by dotted lines).

lation to their shape in this young specimen, shows that they become broadened by the addition of an anterior bony lamina laid down in the membrane surrounding the neural canal. The first neural arch is, however, laid down in its definitive shape in cartilage.

The muscles are less specialised than in the adult. The upper parts of the first two myotomes are attached to the first neural arch, but the third and fourth segments, like those which follow, are attached mesially to the membrane surrounding the neural canal. It may be inferred that in development the outer parts of the myotomes in these segments become functionally continuous with the segments in front of and behind them, and that their movement becomes independent of that of the inner dorsal parts. These retain their continuity with the inner dorsal parts of the first two segments and become

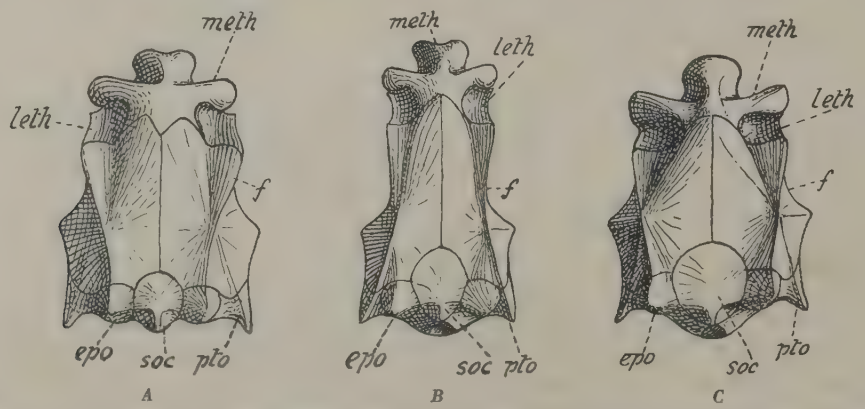


Fig. 20. Upper view of skulls of A. *Melanostomias melanops*; B. *Idiacanthus fasciola*; and C. *Haplostomias tentaculatus*. Lettering as in fig. 6.

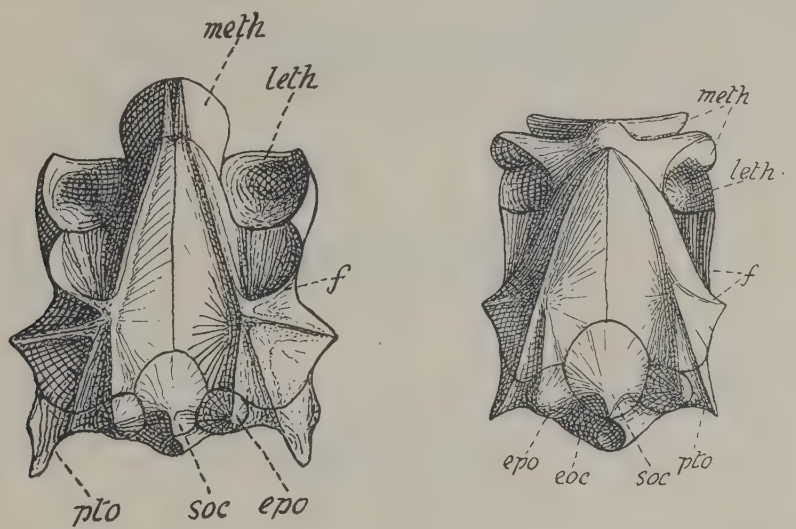
attached, like them, to ligaments supported by the first neural arch, and also to ligaments supported by the notochord in the segments to which they belong.

The intestine of *Eustomias* runs forward for a short distance and then turns back; there are two

pyloric caeca. The hyoid muscles are nearly as in *Bathophilus* except that the interhyoid is inserted below the intermandibular.

Haplostomias, Melanostomias, Echiostoma, Photonectes, and ***Idiacanthus.***

The remaining genera of Stomiatidae, except *Idiacanthus*, have the dorsal and anal fins subequal, and the pelvic fins are generally well behind the middle of the length. All the praemaxillary teeth and



A B

Fig. 21. Upper view of skull of *A. Echiostoma tanneri*; and *B. Photonectes monodactylus*. Lettering as in fig. 6.

all in the lower jaw, except a small anterior pair, are depressible, and except in *Haplostomias*, are bicuspid. There is a pair of teeth on the vomer and a series on each palatine.

The skull of *Haplostomias* (fig. 20, C) differs from that of *Lamprotoxus* and *Bathophilus* especially in the ethmoid region; the anterior projection of the mesethmoid is broader, the lateral processes are nearly at right angles to it, and the lateral ethmoids are relatively broad. The skull of *Melanostomias* is similar, and that of *Echiostoma*, a genus distinguished from *Melanostomias* by having an isolated and produced ray in the pectoral fin, differs rather surprisingly in the absence of the lateral processes of the mesethmoid, and the strong development of the frontal ridges (fig. 21, A). *Photonectes*, which differs from *Melanostomias* in having the mouth curved and the lower jaw prominent, is very similar to it in cranial structure, except for the great width of the median projection of the mesethmoid (fig. 21, B).

Idiacanthus, sometimes placed in a separate family on account of the very elongate form, the long dorsal fin extending forward far in advance of the anal, etc. has the head, mouth, and teeth of *Melanostomias;* the skull is also extremely similar to that of *Melanostomias* (fig. 20, A, B).

We have examined the vertebral column in *Melanostomias*, *Echiostoma* and *Idiacanthus;* all three are extremely like *Bathophilus*, except that the fibrous ring round the notochord is shorter; there are two spinal nerves in front of the first ossified vertebra (fig. 22).

In *Photonectes monodactylus* the hyoid muscles are arranged as in *Bathophilus*, except that the intermandibular is attached mainly to the upper segment of the ceratohyal. In

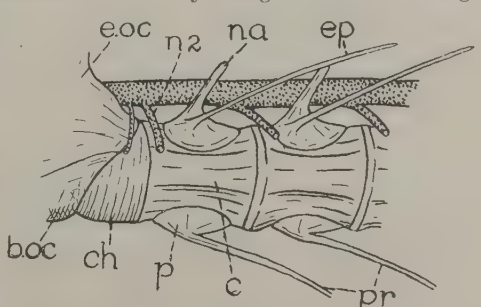


Fig. 22. *Idiacanthus fasciola*; anterior vertebrae. Lettering as in fig. 12.

Melanostomias melanops the muscles are as in *Bathophilus*, except that the interhyoid is single and is forked in front. In *Echiostoma* and *Idiacanthus* the interhyoid is similar to that of *Melanostomias*, but it originates below the intermandibular and does not divide it (fig. 23).

In all five genera the gut is typical, as in *Chirostomias* and *Bathophilus;* i. e. the intestine is straight and has two pyloric caeca (fig. 8, E).

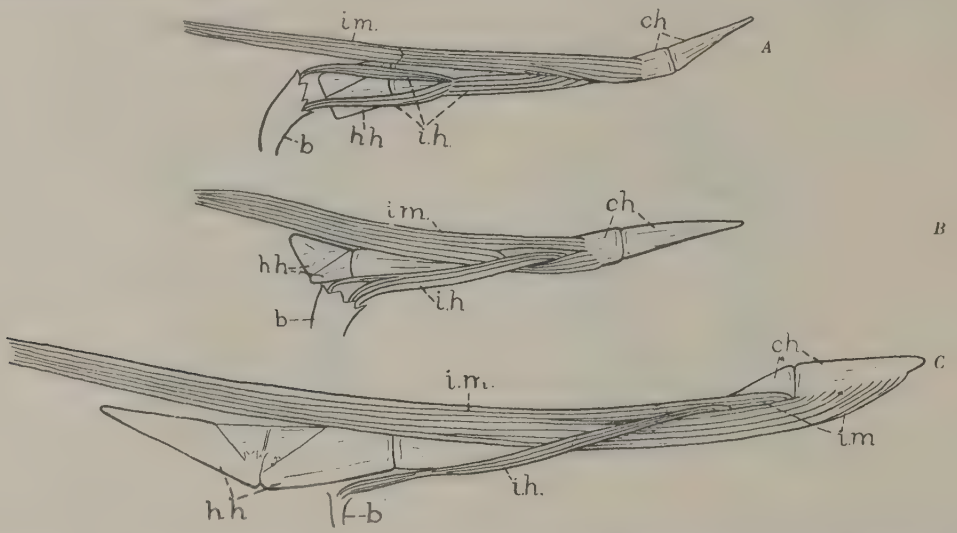


Fig. 23. Hyoid muscles of *A. Idiacanthus fasciola*; *B. Melanostomias melanops* and *C. Photonectes monodactylus*. Lettering as in fig. 14.

Family MALACOSTEIDAE.

The three genera that comprise the family Malacosteidae are distinguished by a wide mouth and a very oblique suspensorium, by the absence of any membrane between the lower jaw and the hyoid arch, so that there is no floor to the mouth, and by the extensibility of the pair of muscles that connect the hyoid with the mandibular symphysis, and are closely bound together to form an elastic cord. The jaws have great freedom of movement, which is increased by the ability of these fishes to throw back the head and so thrust the lower jaw forwards.

In having no parietals and no post-temporals the Malacosteidae resemble *Lamprotoxus*, *Pachystomias*, etc. of the Stomiatidae, but the skull is shorter and broader, with the frontals decreasing in width anteriorly.

In *Photostomias*, which is distinguished by the absence of a subocular luminous organ, except a small one in males, the mesethmoid bifurcates in front, and the large lateral ethmoids extend forwards on each side of it; at their anterior ends the praemaxillaries form a small pointed projection.

In *Aristostomias* the mesethmoid is trifurcate and the lateral ethmoids are small, running downwards from below the anterior ends of the frontals to join a median vertical lamina which is part of the mesethmoid; the praemaxillaries meet in a rather long symphysis, beyond which their anterior ends diverge. *Malacosteus* resembles *Aristostomias* in the structure of the praemaxillaries, in the small lateral ethmoids, and in the mesethmoid with a median ridge and a pair of lateral ridges; but it differs in having the mesethmoid short, vertical, not projecting forwards in advance of the frontals.

In all three genera there are three pairs of spinal nerves in front of the first ossified vertebra, which is separated from the skull by a stretch of notochord at least as long as two vertebrae, enclosed

in a strong fibrous sheath, and having on each side a conical fibrous pad (with gelatinous core in *A. grimaldii* and perhaps in others); this pad is attached in front to exoccipital and epiotic, and behind to

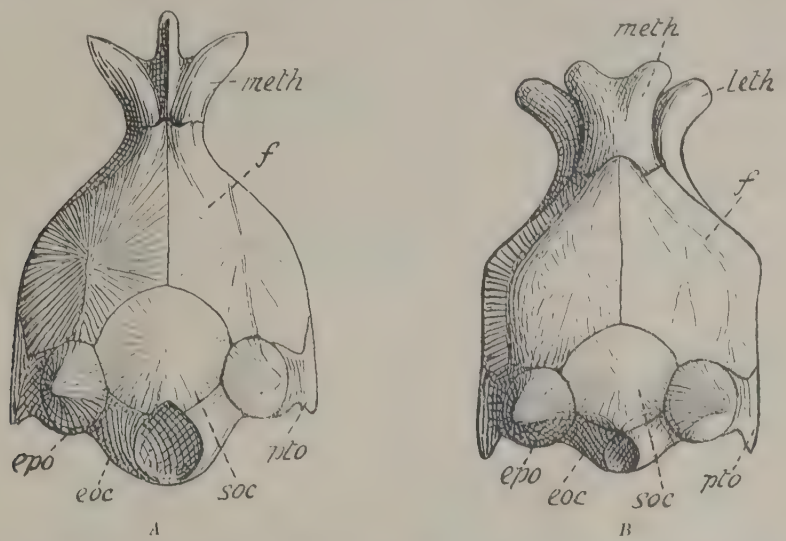


Fig. 24. Upper veiw of skulls of *A. Aristostomias* and *B. Photostomias*. Lettering as in fig. 25.

the first centrum (fig. 26). A pair of dorsal muscles pass anteriorly into a broad tendinous sheet which is attached right across the roof of the skull, the line of attachment being in front of the supra-occipital in *Aristostomias*, across it in *Photostomias* and *Malacosteus*. By the contraction of these muscles the head is

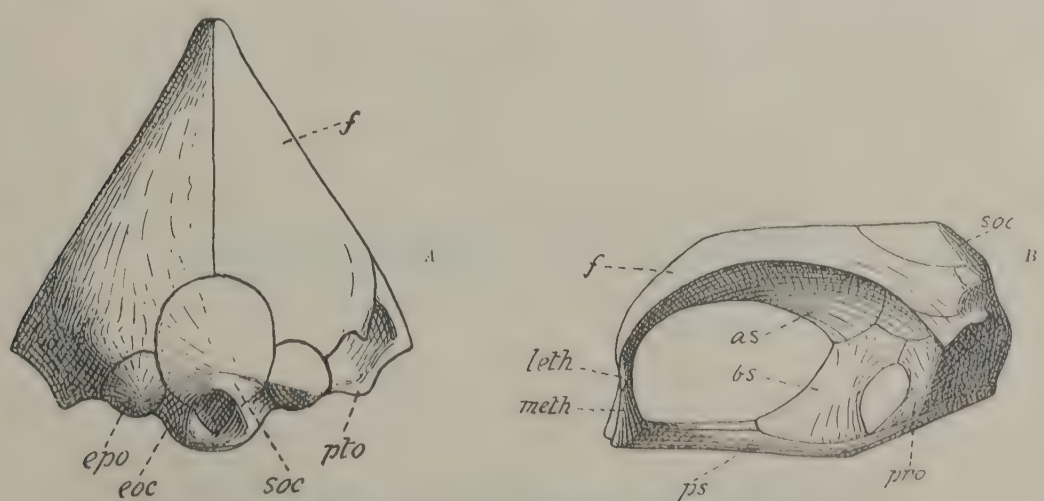


Fig. 25. Skull of *Malacosteus niger*, from above (*A*), and from the side (*B*).
as. allsphenoid; *bs.* basisphenoid; *eoc.* exoccipital; *epo.* epiotic; *f.* frontal; *leth.* lateral ethmoid; *meth.* mesethmoid; *pro.* prootic; *ps.* parasphenoid; *pto.* pterotic; *soc.* supraoccipital.

thrown back; the structure of the anterior part of the vertebral column, unossified but nevertheless both strong and flexible, is certainly related to this habit.

The Malacosteidae resemble the other fishes that throw back the head (*Chauliodus, Stylophorus*) in that this is accomplished by the contraction of a pair of dorsal muscles, but differ from them in

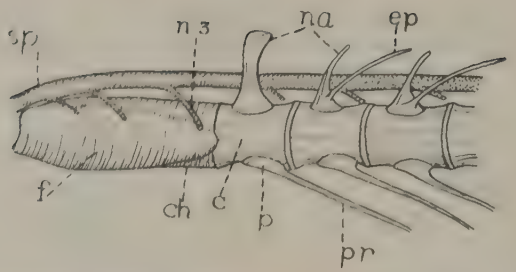


Fig. 26. *Aristostomias grimaldii*; anterior part of vertebral column and spinal cord.
c. centrum; *ch.* notochord; *ep.* epineural; *f.* fibrous pad; *n 3.* third spinal nerve; *na.* neural arch; *p.* parapophysis; *pr.* pleural rib; *sp.* spinal cord.

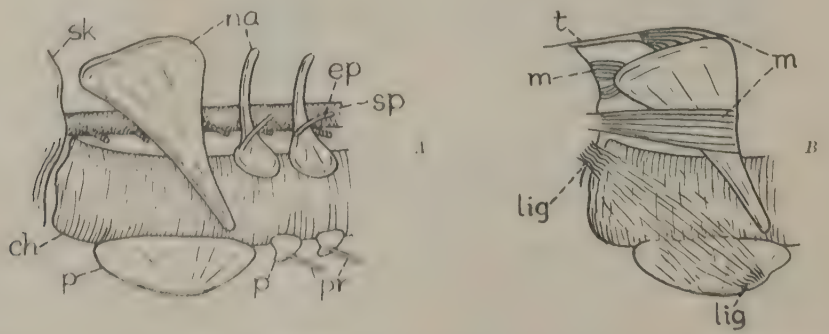


Fig. 27. *Chauliodus danae*. *A.* anterior part of vertebral column (Lettering as in fig. 26). *B.* the same, showing muscles (*m*), tendons (*t*) and ligaments (*lig*) connecting vertebral column with skull.

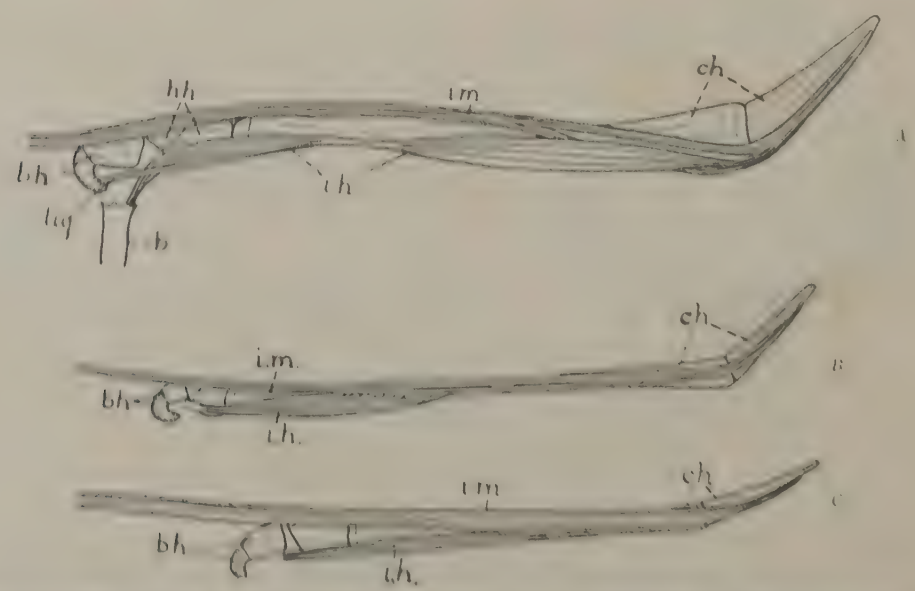


Fig. 28. Hyoid muscles of *A. Aristostomias*, *B. Photostomias* and *C. Malacosteus*. Lettering as in fig. 14.

having a tendinous sheet, instead of a pair of tendons, attached to the top of the skull. Our description of *Chauliodus* in a former report ("Dana" Ocean. Rep. No. 5. p. 31. fig. 23) was not accurate, for dissection shows that the structure we described in a dried skeleton as a long centrum is the anterior end of the notochord enclosed in a fibrous sheath, much as in the Malacosteidae, and followed by several acentrous vertebrae. The enlarged neural laminae serve for the attachment of three small muscles connected with the occipital region of the skull (fig. 27).

Stylophorus (Regan, Proc. R. Soc. B. 96. 1924. p. 193) differs from *Chauliodus* and *Malacosteus* in that the anterior vertebrae are well ossified and have strong zygapophyses; this structure prevents the fish from dislocating its "neck" when it throws back its head, whereas the Malacosteidae and *Chauliodus* achieve this object by having a "neck" without ossified vertebrae. Probably the fact that the Malacosteidae and *Chauliodus* capture relatively large fishes that may struggle when held in their jaws makes flexibility of the region just behind the head necessary; the rigidity of this region in *Stylophorus* may be related to the circumstance that it feeds on small organisms, and suddenly projects the small toothless mouth to catch them.

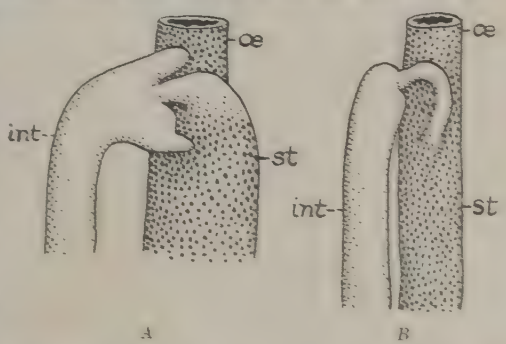


Fig. 29. Anterior part of gut of *A. Aristostomias*: and *B: Malacosteus*.
œ. œsophagus; *st*. stomach; *int*. intestine.

Except that the intermandibular muscle is long and slender, and is attached to the upper segment of the ceratohyal, the hyoid muscles (fig. 28) of *Aristostomias* are as in *Bathophilus*. *Malacosteus* and *Photostomias* differ in the reduction of the interhyoid muscle in relation to the absence of a barbel.

In *Aristostomias* the gut is as in typical Stomiatids, with a straight intestine and a pair of pyloric caeca; in *Photostomias* and *Malacosteus* the pyloric caeca are absent (fig. 29).

6. SYSTEMATIC REVISION

Family STOMIATIDAE

This family includes those Stomiatoid fishes in which both dorsal and anal fins end at a short distance from the caudal, the lower jaw and hyoid arch are joined by a membrane, forming a floor to the mouth, and a pair of relatively short muscles connects the mandibular symphysis with the cerato-hyals.

Synopsis of the Genera.

I. Post-temporals present; parietals present. Teeth fixed; a long palatine series. Dorsal and anal subequal.

A small adipose fin ..... 1. *Chirostomias.*

No adipose fin ..... 2. *Trigonolampa.*

II. No post-temporals; parietals present. Lower jaw with a strong fixed fang anteriorly, and only one inner depressible tooth behind it; second upper tooth a long fang. A pair of teeth on vomer; 0—2 teeth on each palatine.

A. Second praemaxillary tooth fixed in adult; an isolated and produced pectoral ray.

Origin of anal below that of dorsal ..... 3. *Opostomias.*

Origin of anal before that of dorsal ..... 4. *Flagellostomias.*

B. Second praemaxillary tooth depressible.

An isolated and produced pectoral ray; origin of anal before that of dorsal ..... 5. *Thysanactis.*

No isolated pectoral ray; origin of anal nearly below that of dorsal 6. *Leptostomias.*

III. No post-temporals; parietals absent.

A. Vomer toothless.

1. Dorsal and anal fins subequal; upper jaw not protractile; teeth on palatines.

a. First tooth in lower jaw fixed, followed by one or two smaller outer fixed teeth and a series of depressible teeth.

Anterior fangs long; pelvics ventral; no luminous loop .... 7. *Grammatostomias.*

Anterior fangs long; pelvics ventral; a closed loop of luminous tissue on each side of anterior part of body ..... 8. *Lamprotoxus.*

Fangs relatively small; pelvic fins lateral ..... 9. *Bathophilus.*

b. Teeth small, fixed; two luminous patches below the eye ..... 10. *Pachystomias.*

2. Anal longer than dorsal; upper jaw protractile; palatines toothless 11. *Eustomias.*

B. A pair of teeth on vomer. Fangs in praemaxillaries and lower jaw all depressible.

1. Teeth without or with rudimentary cusp; dorsal and anal subequal 12. *Haplostomias.*

2. Teeth bicuspid; dorsal and anal subequal.

a. Cleft of mouth straight.

No isolated pectoral ray ..... 13. *Melanostomias.*

An isolated and produced pectoral ray ..... 14. *Echiostoma.*

b. Cleft of mouth curved; lower jaw prominent ..... 15. *Photonectes.*

3. Teeth bicuspid; dorsal longer than anal; body very elongate ... 16. *Idiacanthus.*

1. CHIROSTOMIAS, gen. nov.

Cleft of mouth straight. Praemaxillaries and lower jaw with fixed curved barbed fangs; maxillary with a series (7—12) of fangs and a few (2—6) small oblique teeth at posterior end; a pair of teeth on vomer, a long series (7—9) on each palatine, and several pairs on basibranchials; teeth on gill-arches mostly in pairs. Postocular luminous organ minute, generally concealed under the skin. Dorsal 18—20. Anal 22—26. Dorsal and anal beginning in same vertical, but anal ending behind dorsal, which is followed by a small adipose fin. Pectoral of 6 slender rays, all branched distally, one or more with a luminous swelling. Pelvics of 1 simple and 6 forked rays, inserted somewhat behind middle of length of fish.

1. CHIROSTOMIAS PLIOPTERUS, sp. n. (Pl. I, fig. 1).

Depth of body 6 to 7⅔ in length, length of head 5 to 6. Snout as long as or longer than diameter of eye, which is 4 to 5 in length of head. Barbel ⅔ to ¾ length of head, with stout black stem for about ⅓ of its length, ending in a large ovate swelling with three terminal papilliform projections, the posterior and median with translucent skin and pigmented core, the anterior translucent; anterior projection bearing on its anterior edge a short stalk with a brush of 4 to 6 filaments, beyond this a club-shaped appendage, and at end of posterior edge two prominences, each with a pair of filaments; median projection with double tip; posterior projection with a fringe of filaments along the posterior edge, the distal one enlarged and prolonged, with head-like swellings. Dorsal 18—20. Anal 22—26. Pectorals far forward and close together; sixth ray longest, sometimes more than twice as long as head, with a club-shaped luminous swelling; similar but smaller luminous swellings sometimes present on first and fifth

rays. Pelvics equidistant from eye and base of caudal, or a little nearer caudal. Photophores in ventral series I.-P. 8—9; P.-V. 26—28; V.-A. 18—20 (5—7 above anal); A.-C. 10—11; in lateral series O.-V. 24; V.-A. 18—20.

Atlantic, north of 20° N.

Five specimens, 60—115 mm. in length to base of caudal, from Stations 38, 928, 1031, 1072 and 1377 with 150 to 300 metres of wire out.

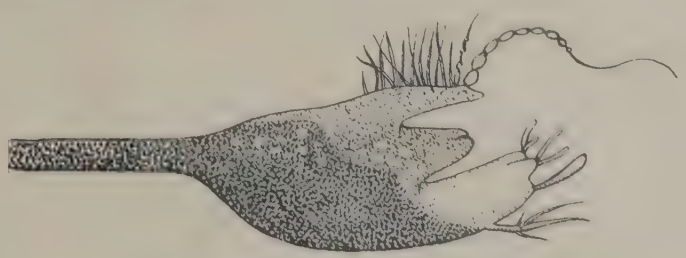


Fig. 30. *Chirostomias pliopterus*; end of barbel.

Two specimens of 33 and 35 mm. from Stations 1142 (1000 M.W.) and 1342 (200 M.W.) have most of the maxillary fangs undeveloped, and the pectoral and pelvic rays simple. In the smaller the skin of the barbel is unpigmented, but the bulb is black inside.

2. **TRIGONOLAMPA,** gen. nov.

Cleft of mouth straight. Praemaxillaries and lower jaw with fangs of moderate size, curved, pointed, and fixed; maxillary with a few erect and a series of small oblique teeth; one or two pairs of teeth on vomer and a long palatine series (13 teeth) on each side; eight pairs of teeth on basibranchials; small teeth on gill-arches. Postocular luminous organ close to eye; behind it a small rounded luminous patch and above it a large triangular one extending backwards from eye. Dorsal 18. Anal 19. Dorsal and anal fins beginning in same vertical. Pectoral 5; outermost ray swollen at base. Pelvics 7-rayed, nearly in middle of length.

1. TRIGONOLAMPA MIRICEPS sp. n. (Pl. I, fig. 2).

Depth of body 8 in the length, length of head $5^1/_3$. Diameter of eye 5 in length of head, interorbital width $3^1/_3$. Barbel $^3/_4$ length of head, tapering, ending in a small bulb with short terminal filament. Dorsal 18. Anal 19. Pectoral 5. Pelvics slightly nearer to base of caudal than to end of snout. Photophores in ventral series, I.-P. 11; P.-V. 22; V.-A. 24; A.-C. 11; in lateral series O.-V. 22; V.-A. 26.

Atlantic, south of Ireland.

A single specimen, 105 mm. in length to base of caudal, from Station 52 (48° 42′ N. 12° 20′ W.) with 1860 metres of wire out.

3. **OPOSTOMIAS,** Günther 1878.

Challenger Deep Sea Fishes, p. 208 (1887).

Moderately elongate. Cleft of mouth straight; jaws strong. Teeth tapering to sharp ends; in each jaw four fixed teeth on each side, the first lower and second upper long fangs, the lower pair received into pits in the upper jaw, perforating the praemaxillaries; a single inner depressible tooth in each jaw behind the anterior fang; maxillary teeth minute, not piercing the skin. A pair of small teeth on vomer; palatines and basibranchials toothless. Teeth on gill-arches small. Dorsal 21. Anal 23. Pectoral 1 + 3, the isolated ray produced. Pelvics 7-rayed, a little in advance of middle of length.

1. OPOSTOMIAS MICRIPNUS, Günther, 1878.

Challenger Deep Sea Fishes, p. 208, pl. LIII, fig. A (1887).

Depth of body $7^1/_2$ in the length, length of head $8^1/_2$. Diameter of eye $7^1/_2$ in length of head. Postocular luminous organ small. Barbel $1^4/_5$ length of head; stem black with white spots; bulb elongate,

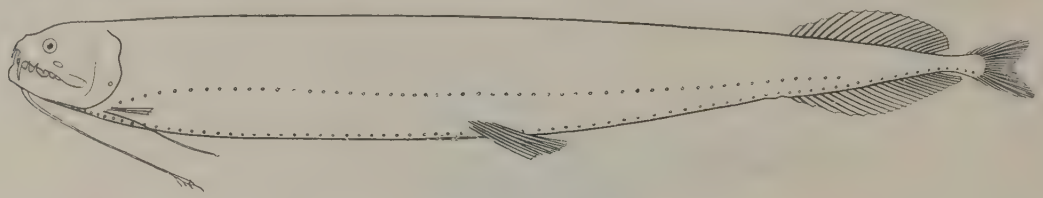


Fig. 31. *Opostomias micripnus* (after Günther).

with pigmented terminal filament; an unpigmented filament proximal to bulb, and two median and three pairs on bulb. Dorsal 21. Anal 23. Pectoral 1 + 3; produced ray $^8/_5$ length of head, its distal $^1/_3$ white

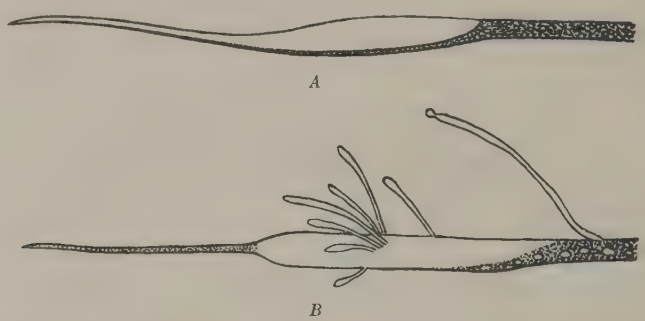


Fig. 32. *Opostomias micripnus*. *A*: End of isolated pectoral ray; *B*. End of barbel.

with a pigmented thread along one edge, slightly swollen and then tapering. Photophores in ventral series, I.-P. 5; P.-V. 30; V.-A. 26; A.-C. 13; in lateral series O.-V. 27; V.-A. 26.

South of Australia.

The type measures 380 mm. in length to base of caudal.

4. FLAGELLOSTOMIAS, Parr, 1927.

Bull. Bingham Ocean. Coll. III (2) p. 49.

Elongate. Cleft of mouth straight; jaws strong. In each jaw a few fixed teeth with spear-shaped ends, the first in lower jaw and second in upper long fangs, the lower fitting in a groove on outer side of upper jaw between first and second teeth; a single inner depressible tooth next to anterior fang in lower jaw; maxillary with or without an erect tooth and with a series of small oblique teeth. A pair of teeth on vomer and 1 or 2 on each palatine; a pair of small teeth on basibranchials; teeth on gill-arches small. Dorsal 14—17. Anal 23—26, extending forward well in advance of dorsal. Pectoral 1 + 10, the isolated ray long. Pelvics 7-rayed, well behind middle of length.

1. FLAGELLOSTOMIAS BOUREEI, Zugmayer, 1913. (Pl. II, fig. 2).

Eustomias boureei, Zugmayer, Bull. Inst. Océan. Monaco, 253, p. 3.
Flagellostomias tyrannus, Parr, Bull. Bingham Ocean. Coll. III (2), 1927, p. 50, figs. 29, 30.

Fig. 33. *Flagellostomias boureei.* End of barbel in the type, *A.* and in four "Dana" specimens, *B—E.*

Depth of body 9 to 12 in the length, length of head $6^1/_2$ to $8^1/_2$. Diameter of eye 5 to 6 in length of head. Postocular luminous organ small. Barbel from about $^1/_3$ (young) to $^2/_3$ length of fish; stem pigmented, with white spots; bulb oblong or ovate, bearing a much smaller distal bulb; distal part of stem, and bulb, with numerous unpigmented filaments. Dorsal 14—17. Anal 23—26. Pectoral 1 + 10; isolated ray long, in adult more than twice as long as head, near end bearing an ovate or elongate bulb with terminal filament. Pelvic 7. Photophores in ventral series I.-P. 8—10; P.-V. 31—33; V.-A. 14—16; A.-C. 15—17; lateral O.-V. 30—32; V.-A. 13—17.

Atlantic; Caribbean Sea.

Ten specimens, 39 to 322 mm. in length to base of caudal, from Stations 91, 1142, 1157, 1159, 1162, 1163, 1183 and 1377, with 200—5000 metres of wire out. With these we have compared the type of the species, 90 mm. in length to base of caudal.

Fig. 34. *Flagellostomias boureei.* End of isolated pectoral ray in three specimens.

5. THYSANACTIS, gen. nov.

Elongate. Cleft of mouth straight; jaws rather strong. Teeth tapering to a sharp point; in upper jaw first moderate, fixed, second long, depressible, followed by 2 or 3 outer small fixed teeth and one inner depressible tooth; lower jaw with a small fixed tooth in front, followed by a strong fixed anterior fang; next an inner depressible tooth and 4 to 6 smaller fixed

teeth; maxillary with or without a few erect teeth, and with a series of small oblique teeth. A pair of teeth on vomer and one on each palatine; two or three pairs on basibranchials; teeth on gill-arches in pairs. Dorsal 17—18. Anal 21—25, beginning a little in advance of dorsal. Pectoral 1 + 10—11, the isolated ray produced. Pelvics 7-rayed, well behind middle of length.

1. THYSANACTIS DENTEX, sp. n. (Pl. II, fig. 1).

Depth of body 9 to 12 in the length, length of head 7 to $8^1/_3$. Diameter of eye 4 to 5 in length of head. Postocular luminous organ small. Barbel about as long as head, pigmented with an anterior and a posterior series of white spots that become continuous streaks distally; tip white, tapering, bearing a minute rounded terminal body; white part with a double series of short filaments, anterior and posterior, and near proximal end of each series a longer filament, directed distally and extending beyond end of barbel. Dorsal 17—18. Anal 21—25. Pectoral $1\frac{I}{2}$+ 10—11; isolated ray longer than head, $^1/_7$—$^1/_5$ length of fish, pigmented, distally with a tassel of 5 or 6 long unpigmented filaments. Pelvic 7. Ventral photophores, I.-P. 20; P.-V. 31—32; V.-A. 14—16; A.-C. 11—12; lateral, O.-V. 30—32; V.-A. 14—16.

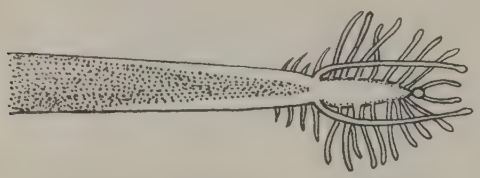


Fig. 35. *Thysanactis dentex*, end of barbel.

Western Atlantic; Caribbean Sea.

Five specimens, 54—139 mm. in length to base of caudal, from Stations 1165, 1180, 1183, 1184 and 1185, with 300—3000 metres of wire out.

Fig. 36. *Thysanactis dentex*; end of isolated pectoral ray of two specimens.

6. LEPTOSTOMIAS, Gilbert 1905.

Bull. U. S. Fish. Comm. XXIII, p. 606.

Elongate; head short. Mouth straight, oblique; jaws rather strong. Teeth tapering to a sharp point; first tooth in upper jaw moderate, fixed; second long, depressible, followed by a few small fixed outer teeth and one or two inner depressible teeth; lower jaw with a strong fixed fang on each side of symphysis; behind it a few small outer fixed teeth and one longer inner depressible tooth. Maxillary with a few erect and a series of small oblique teeth. A pair of teeth on vomer and one on each palatine; two pairs of teeth on basibranchials; teeth on gill-arches short, in pairs. Postocular luminous organ very small. Dorsal 16—21. Anal 20—28, beginning below or slightly in advance of origin of dorsal. Pectoral 10—11, without isolated ray. Pelvics 7-rayed, well behind middle of length.

Synopsis of the Species.

I. Stem of barbel without filaments near base.

P.-V. photophores 41; barbel with a series of minute filaments on proximal part of bulb, extending on to stem, and with pairs of minute filaments on distal part of bulb ..... 1. *haplocaulus*

P.-V. photophores 45—46; barbel $^1/_4$—$^1/_3$ length of fish; filaments of bulb probably as in *L. haplocaulus* in adult ..... 2. *gracilis*

P.-V. photophores 45—47; barbel nearly as long as fish; bulb with minute slightly swollen filaments, not forming a regular series ..... 3. *longibarba*

II. Stem of barbel with one or more filaments near base.

A. Bulb of barbel without a pair of filaments arising from near its base.

1. Bulb without filaments or appendages; a pair of filaments near base of stem of barbel.

D. 16; A. 20 ..... 4. *macronema*

D. 20; A. 25 ..... 5. *leptobolus*

2. Bulb with one or two minute filaments or tubercles near tip.

D. 21; A. 28; stem of barbel with basal filament; bulb obliquely truncated, with one tubercle ..... 6. *analis*

D. 21; A. 26; stem of barbel with basal filament, and with 2 pairs of short fine filaments below bulb, which is truncated, with two tubercles ..... 7. *problematicus*

B. Bulb of barbel with one or two pairs of well-developed filaments arising from near its base. D. 19—20; A. 23—25.

Bulb broadly rounded distally ..... 8. *gladiator*

Bulb with narrow papilla-like tip ..... 9. *ramosus*

1. LEPTOSTOMIAS HAPLOCAULUS, sp. n.

Depth of body $13^1/_2$ in the length, length of head $9^1/_2$. Diameter of eye $5^1/_2$ in length of head. Maxillary with oblique teeth, the first 2 or 3 larger and nearly erect. Barbel $^3/_4$ length of fish; stem black,

Fig. 37. *Leptostomias haplocaulus*; end of barbel.

without filaments or appendages, except just proximal to bulb; bulb about $^3/_5$ length of head, slightly curved, narrow at tip; a series of 8 minute filaments on distal part of stem and proximal half of convex side of bulb; 4 pairs of minute filaments on distal half of bulb. Dorsal 19. Anal 23. Pectoral 10. Pelvic 7. Photophores in ventral series I.-P. 10; P.-V. 41; V.-A. 21; A.-C. 11; in lateral series O.-V. 41; V.-A. 20.

Atlantic.

A single specimen, 100 mm. in length to base of caudal, from Station 1341, with 200 metres of wire out.

2. LEPTOSTOMIAS GRACILIS, sp. n.

Depth of body about 13 in the length, length of head $8^3/_4$ to $9^1/_2$. Diameter of eye 6 in length of head. Maxillary with one or two erect teeth, the rest oblique. Barbel $^1/_4$ to a little more than $^1/_3$ length

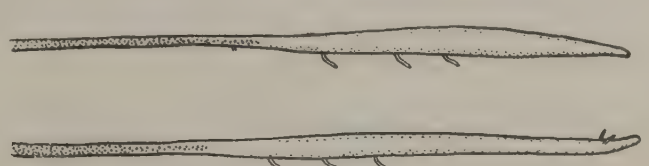


Fig. 38. *Leptostomias gracilis*; end of barbel of two specimens.

of fish; stem black, without filaments; bulb slender, narrower at tip, about $^1/_2$ length of head, generally with one or a series of minute filaments on its proximal half and sometimes with a pair distally. Dorsal 19. Anal 23—24. Pectoral 10. Pelvic 7. Photophores in ventral series I.-P. 10; P.-V. 45—46; V.-A. 22; A.-C. 12—13; in lateral series I.-V. 43—45; V.-A. 22.

Atlantic.

Four specimens, one of 70 mm. from Station 1160 (1000 M.W.) and three of 73 to 75 mm. from Station 1162 (300 M.W.).

3. LEPTOSTOMIAS LONGIBARBA, sp. n. (Pl. I, fig. 3).

Depth of body 13 to $14^1/_2$ in the length, length of head 9 to $10^1/_2$. Diameter of eye 5 in length of head. Maxillary with one to three erect and a series of minute oblique teeth. Barbel nearly as long as fish, reaching beyond origin of anal fin; stem black, without filaments; bulb long, about $^3/_5$ length of

Fig. 39. *Leptostomias longibarba*; end of barbel.

head, tapering, with minute slightly swollen filaments. Dorsal 21. Anal 24—26. Pectoral 10—11. Pelvic 7. Photophores in ventral series, I.-P. 10; P.-V. 45—47; V.-A. 22—23; A.-C. 11—12; in lateral series O.-V. 44—46; V. A. 22—23.

Atlantic.

Two specimens, one 250 mm. in length to base of caudal, from Station 1171, with 300 metres of wire out; in this specimen the bulb of the barbel is somewhat shrunken and only three filaments can be seen. The second specimen, 115 mm., from Station 830 (M.W. 100) has about 20 filaments on the bulb.

A specimen 53 mm. in length to base of caudal, from Station 1116, with 250 metres of wire out may belong to this species. Ventral photophores P.-V. 44, Barbel broken, 16 mm. of stem remaining.

4. LEPTOSTOMIAS MACRONEMA, Gilbert, 1905.

Bull. U. S. Fish. Comm. XXIII, 1903, p. 607 pl. LXXII, fig. 3.

Melanostomias macronema Parr, Bull. Bingham Ocean. Coll. III (2) 1927, p. 49.

Depth 14 in length, head 8. Barbel $^8/_5$ length of fish; stem with a pair of long fine filaments near the base; bulb long and slender. D. 16. A. 20. Ventral photophores I.-P. 11; P.-V. 43; V.-A. 21; A.-C. 12.

Hawaii.

Length of type, 74 mm. to base of caudal.

5. LEPTOSTOMIAS LEPTOBOLUS, sp. n.

Depth of body about 13 in the length, length of head $8^1/_2$ to 9. Diameter of eye 6 in length of head. Maxillary with 3 or 4 small erect teeth followed by a series of minute oblique teeth. Barbel $^4/_5$ to nearly $^5/_4$ length of fish, with a pair of filaments near the base, and with elongate bulb, without filaments

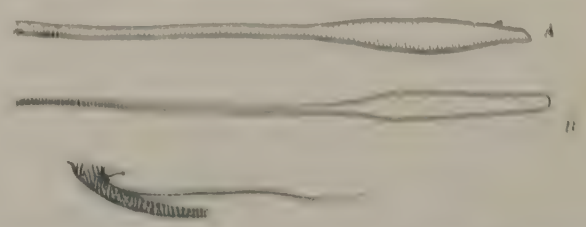


Fig. 40. *A. Leptostomias analis*; end of barbel. *B. L. leptobolus*; proximal and distal end of barbel.

or appendages. Dorsal 20. Anal 25. Pectoral 10. Pelvic 7. Photophores in ventral series I.-P. 10; P.-V. 43; V.-A. 20; A.-C. 12.-13; in lateral series O.-V. 42—43; V.-A. 20.

Atlantic; Caribbean Sea.

Two specimens, 68 and 95 mm. in length to base of caudal, from Stations 1184 and 1185, with 300 metres of wire out.

6. LEPTOSTOMIAS ANALIS, sp. n.

Depth of body 14 in length, length of head nearly 9. Diameter of eye $5^1/_2$ in length of head. Maxillary with a series of small teeth, the first four erect, the rest oblique. Barbel nearly as long as fish; stem black, with minute luminous dots but no patches, giving off a slender black filament near its base; bulb white, elongate, obliquely truncated, with a minute tubercle near the tip. Dorsal 21. Anal 28. Pectoral 10. Pelvic 8. Photophores in ventral series; I.-P. 10; P.-V. 40; V.-A. 22; A.-C. 14; in lateral series O.-V. 40; V.-A. 22.

Atlantic.

A single specimen, 168 mm. in length to base of caudal, from Station 1192 (N. of St. Croix), with 600 metres of wire out.

7. LEPTOSTOMIAS PROBLEMATICUS, Parr, 1927.

Melanostomias problematicus, Parr, Bull. Bingham Ocean Coll. III, (2) p. 46, fig. 26.

Depth 17 in length, head $9^1/_2$. Barbel nearly $^2/_3$ length of fish, with a filament near its base, and with two pairs of small filaments just below the bulb; which is truncated distally and bears two minute tubercles at its end. D. 21; A. 26. Photophores in ventral series I.-P. 11; P.-V. 42; V.-A. 20; A.-C. 13.

Western Atlantic.

Length of type, 172 mm. to base of caudal.

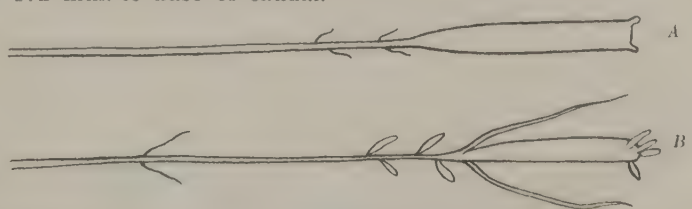


Fig. 41. End of barbel of *A. Leptostomias problematicus* (after Parr); *B. L. gladiator* (after Zugmayer).

8. LEPTOSTOMIAS GLADIATOR, Zugmayer, 1911.

Nematostomias gladiator, Zugmayer, Rés. Camp. Sci. Monaco, XXXV, 1911, p. 76, pl. III, fig. 5.

Depth $12^3/_4$ in length, head $8^1/_2$. Barbel $^1/_2$ length of fish, with a filament near its base, a pair not far below the bulb, and two pairs of short swollen filaments immediately below the bulb, which is cigar-shaped, with broadly rounded end, with a pair of long filaments at its base, and three short swollen filaments near its tip. D. 20. A. 24. Photophores in ventral series I.-P. 11; P.-V. 40; V.-A. 21; A.-C. 13.

Eastern Atlantic.

The type measures 270 mm. in length to base of caudal.

9. LEPTOSTOMIAS RAMOSUS, sp. n.

Depth of body 10 to 13 in the length, length of head $7^1/_2$ to $8^1/_2$. Diameter of eye 5 to 6 in length of head. Maxillary with a series of small oblique teeth, the anterior two or three sometimes erect. Barbel

from less than 1/8 (young) to nearly 1/2 length of fish; stem black, with luminous patches; near base one or two pairs of filaments, and usually an unpaired one; other filaments on stem, including a pair not far below the bulb; bulb white, generally more than 1/2 length of head, slender, with narrow

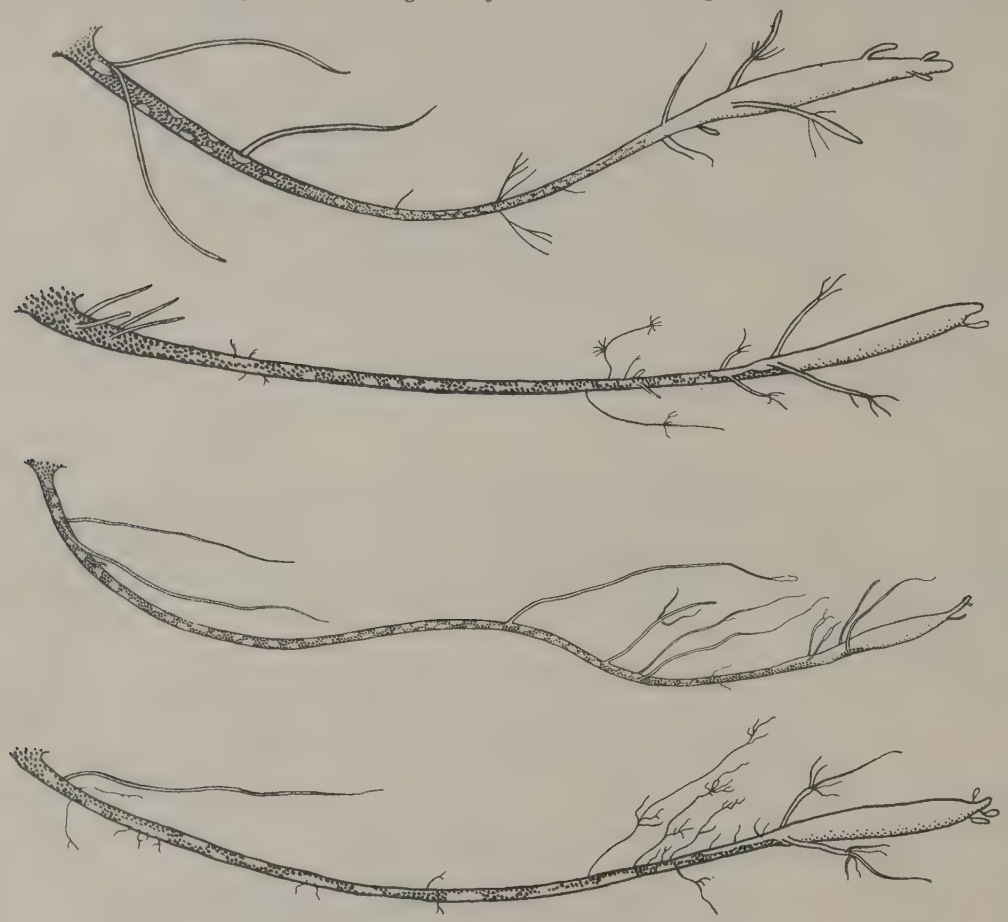


Fig. 42. *Leptostomias ramosus.* Barbels of four specimens.

papilla-like tip, bearing one or two pairs of stout filaments near the base, and one to three short swollen filaments, often a pair near tip and another a little behind them. Dorsal 19—20. Anal 23—25. Pectoral 10. Pelvic 7. Photophores in ventral series I.-P. 10—11; P.-V. 39—43; V.-A. 21—22; A.-C. 11—12; in lateral series O.-V. 39—42; V.-A. 20—22.

Atlantic.

Twelve specimens, 56—180 mm. in length to base of caudal, from Stations 829, 855, 865, 1019, 1032, 1153, 1155, 1157, 1353, 1374, and 1380, with 150 to 1000 metres of wire out.

7. **GRAMMATOSTOMIAS**, Goode & Bean, 1895.

Oceanic Ichthyology, p. 110.

Cleft of mouth straight. Teeth acute; in upper jaw first moderate, fixed, second long, depressible; in lower jaw first very long, fixed; behind these in each jaw an outer fixed tooth and a series of depres-

sible teeth; maxillary with a series of small oblique teeth. A series of teeth on each palatine, and three pairs on basibranchials. Dorsal 20. Anal 24, beginning below origin of dorsal. Pectoral 5. Pelvics 7-rayed, in advance of middle of length.

This genus appears to differ from *Lamprotoxus* only in the absence of the loop of luminous tissue on the body.

GRAMMATOSTOMIAS DENTATUS, Goode & Bean, 1895.

Oceanic Ichthyology, p. 110, pl. XXXV, fig. 133; Parr, Bull. Bingham Ocean. Coll. III (2) p. 92, figs. 10, 52.

Depth of body 7 (Goode & Bean) or 9 to 10 (Parr) in the length, length of head about 6. Diameter of eye twice length of postocular luminous organ, 5 in length of head. Barbel slender, tapering, $^1/_3$ length of fish. Dorsal 20. Anal 24. Pectoral 5, short, some rays thick, some filamentous. Ventral photophores, I.-P. 7; P.-V. 16; V.-A. 21; A.-C. 12; lateral, O.-V. 15—16; V.-A. 22.

Western Atlantic.

The type measures 145 mm. in length to base of caudal.

8. LAMPROTOXUS, Holt & Byrne, 1913.

Fisheries Inv. Ireland 1912, 1, p. 7.

Moderately elongate. Cleft of mouth straight. Teeth acute, the larger slightly barbed; in upper jaw first tooth moderate, fixed, second long, depressible; in lower jaw first long, fixed; behind these in upper jaw a few smaller teeth, fixed and depressible alternating, in lower jaw an outer fixed tooth and an inner series of depressible teeth; maxillary with a series of small oblique teeth. Vomer toothless; two teeth on each palatine, and two pairs on basibranchials; teeth on gill-arches in pairs. Dorsal 18—21. Anal 20—23, begining below origin of dorsal. Pectoral 4—11, with one or more fleshy rays. Pelvics 7-rayed, a little in advance of middle of length. A closed loop of luminous tissue on each side of body between head and pelvic region, with a thicker zig-zag part at anterior end of lower line.

Synopsis of the Species.

I. A short backward projection at anterior end of zig-zag part of loop. Pectoral with 2 (or 3) thick fleshy rays.
   P. 10. ..... 1. *flagellibarba.*
   P. 4—6. ..... 2. *paucifilis.*
II. A short forward projection or hook at anterior end of zig-zag part of loop. Pectoral 10—11, with one thick fleshy ray. ..... 3. *phanobrochus.*

1. LAMPROTOXUS FLAGELLIBARBA, Holt & Byrne, 1910.

Grammatostomias flagellibarba, Holt & Byrne, Ann. Mag. Nat. Hist. (8) VI, p. 294.

Lamprotoxus flagellibarba, Holt & Byrne, Fisheries Inv. Ireland, 1912, 1, p. 8, pl. I (1913); Parr, Bull. Bingham Ocean. Coll. III, (2) 1927, p. 93.

Depth of body 7 in the length, length of head $6^1/_4$, Diameter of eye $7^1/_2$ in length of head; postocular luminous organ narrow, a little shorter than eye and well separated from it. Barbel 6 times as long as fish. Dorsal 21. Anal 23. Pectoral 10, second and third rays thick and fleshy, three others somewhat fleshy, rest filamentous. Pelvics 7-rayed, nearer to end of snout than to base of caudal. Zig-zag part of loop with a small backward projection anteriorly, and with three downward angles. Luminous dots

aggregated especially below the zig-zag part of loop and on operculum. Photophores in ventral series I.-P. 6; P.-V. 16; V.-A. 19; A.-C. 10; in lateral series O.-V. 17: V.-A. 20.

Atlantic.

Here described from the type, 168 mm. in length to base of caudal, from off Ireland; on the original label it is noted that the barbel is 1140 mm. long. Parr's specimen of 106 mm., with three thick pectoral rays, is probably the same species.

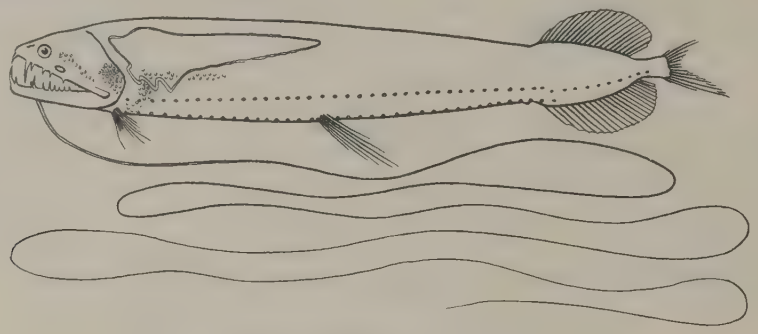


Fig. 43. *Lamprotoxus flagellibarba* (after Holt and Byrne).

2. LAMPROTOXUS PAUCIFILIS, sp. n.

Depth of body $6^2/_3$ in length, length of head $5^2/_3$. Diameter of eye 6 in length of head. Postocular luminous organ small. Maxillary teeth very small. Barbel $^1/_2$ length of fish (probably broken). Dorsal 18—19. Anal 22. Pectoral 4—6, with two fleshy rays. Pelvics 7-rayed, nearer to end of snout than to base of caudal. Luminous loop as in *L. flagellibarba*, but zig-zag part thicker, and with four downward angles. Photophores in ventral series I.-P. 7; P.-V. 17; V.-A. 21—22; A.-C. 11; in lateral series O.-V. 18; V.-A. 21—22.

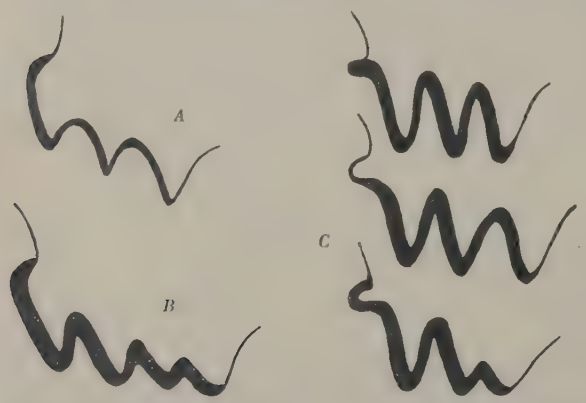


Fig. 44. Zig-zag part of luminous loop of *A. Lamprotoxus flagellibarba*; *B. L. paucifilis*; *C. L. phanobrochus* (3 specimens).

Atlantic.

A specimen 49 mm. long to base of caudal. from Station 844, with 200 metres of wire out. A second, 26 mm. to base of caudal, from Station 1019 (300 M.W.), is essentially similar, except that the luminous loop is not developed.

3. LAMPROTOXUS PHANOBROCHUS, sp. n.

Depth of body 7 to $8^1/_3$ in the length, length of head $5^1/_3$ to 6. Diameter of eye 6 in length of head. Postocular luminous organ small. Barbel? Dorsal 18—20. Anal 20—24. Pectoral 9—11, with one fleshy ray. Pelvics 7-rayed, nearer to end of snout than to base of caudal. Luminous loop as in *L. flagellibarba*, but with zig-zag part thicker and with a short hook or projection forwards at its anterior end. Photophores in ventral series I.-P. 7; P.-V. 17; V.-A. 20—22; A.-C. 10—12; in lateral series O.-V. 16—17; V.-A. 21—22.

Atlantic; Caribbean Sea.

Four specimens, 27—43 mm. in length to base of caudal, from Stations 925, 1061, 1183 and 1185, with 150—4000 metres of wire out. The barbel is incomplete in all, the part left measuring $^1/_3$—$^2/_3$ the length of the fish.

9. BATHOPHILUS, Giglioli, 1884.

"Pelagos", p. 261, (Genova).
Dactylostomias, Garman, Mem. Mus. Comp. Zool. XXIV, 1899, p. 279.
Trichostomias, Zugmayer, Rés. Camp. Sci. Monaco, XXXV, 1911, p. 78.
Gnathostomias, Pappenheim, Deutsch. Südpolar-Exped., Tiefseefische, p. 171, (1911).

Form varying from deep and compressed (*B. brevis*) to slender and rounded (*B. filifer*). Cleft of mouth straight. Praemaxillaries with an anterior pair of fixed teeth followed on each side by a series of unequal depressible teeth, the first rather long and extending downward over the lower jaw; maxillary with a series of small oblique teeth; lower jaw on each side with a rather strong anterior and a smaller lateral fixed tooth, and an inner series of depressible teeth; teeth all simple, acute, not barbed. Vomer toothless; one or two teeth (rarely more) on each palatine, and two pairs on basibranchials; gill-arches toothless. Eyes below an oval opening in the skin, generally partly concealed. Barbel long, slender, tapering. Dorsal and anal subequal, of 9 to 18 rays. Paired fins long, with slender rays, some or all of which may be free; pectoral of 1 to 47 rays; pelvic of 4 to 26 rays, generally inserted just above the lateral series of photophores, but sometimes higher.

We have found that the apparent size of the eyes varies so much that we have not used this character in describing the species; generally the eyes look small, but they may protrude and appear much larger, and we have seen several specimens like that described by Pappenheim as having the eye of one side with a diameter nearly twice that of the other. It is difficult to count the serial photophores except in faded specimens, and we have not tried to count them thoroughly. The smaller photophores, however, are conspicuous over the whole surface, giving the skin a characteristic granular appearance. The skin often has a metallic lustre, but dull blackish and lustrous specimens occur in the same species.

Synopsis of the Species.

I. Depth $2^1/_4$ to 6 in the length.
  A. Pelvic fins much nearer dorsal than ventral profile (*Notopodichthys*, subgen. n.).
    Depth $2^1/_4$ to $2^3/_4$ in length. P. 11—13; Pv. 11—14 ..... 1. *brevis*.
  B. Pelvic fins about equidistant from dorsal and ventral profile (*Bathophilus*).
    Depth 5 to 6 in length. P. 34—47; Pv. 18—26 ..... 2. *nigerrimus*.
    Depth 6 in length. P. 16—19; Pv. 16 ..... 3. *proximus*.

II. Depth $6^1/_2$ to 12 in the length.
  A. Pectoral rays in two well-separated groups (*Trichostomias*).
    P. 3—6 + 7—11; Pv. 7—10 ..... 4. *longipes*.
    P. 3 + 4— 5; Pv. 16—20 ..... 5. *schizochirus*.
    P. 3 + 4; Pv. 9 ..... 6. *digitatus*.
    P. 2 + 1—2; Pv. 4—6 ..... 7. *metallicus*.
  B. Pectoral of 4 to 8 rays, the first 2 or 3 stronger than the rest (*Gnathostomias*).
    P. 6—8; Pv. 11—14 ..... 8. *longipinnis*.
    P. 5; Pv. 9 ..... 9. *ater*.
    P. 4; Pv. 16 ..... 10. *indicus*.
  C. Pectoral of 2 separate rays inserted close together (*Trichochirus*, subgen. n.).
    Pv. 11—13 ..... 11. *pawneei*.
    Pv. 9—10 ..... 12. *melas*.
    Pv. 6—8 ..... 13. *chironema*.
  D. Pectoral of a single ray (*Dactylostomias*).
    Pv. 4—5 ..... 14. *filifer*.

1. BATHOPHILUS BREVIS, sp. n. (Pl. III, fig. 1).

Ovate, compressed. Depth of body $2^1/_4$ to $2^3/_4$ in the length, length of head $2^2/_5$ to 3. Postocular luminous organ well separated from eye; a small luminous patch in front of or below it. Dorsal 10—11. Anal 9—10. Pectoral 2 + 9—11. Pelvic of 11 to 14 rays, inserted much nearer dorsal than ventral profile, and about equidistant from end of snout and origin of dorsal. A luminous patch on middle of side, between origin of dorsal and anal fins. No serial photophores.

Atlantic.

Here described from three specimens, 26 to 48 mm. in length to base of caudal, from Stations 1162, 1175 and 1368, with 400 to 1000 metres of wire out. Three others, 15 to 21 mm., from Stations 883 and 1341 (150—600 M.W.) are not included except for counts of fin-rays. Of the six specimens two have 11 pelvic rays, two 13 and two 14. The postocular organ is relatively larger and nearer to the eye in the young.

2. BATHOPHILUS NIGERRIMUS, Giglioli, 1884. (Pl. III, fig. 2).

"Pelagos", p. 261, fig.; Balducci, Ann. Inst. Océan, Paris, VII, (3) 1915, p. 1, pl. I.

Depth of body 5 to 6 in the length, length of head 4 to $4^1/_2$. Postocular organ with a small pearl-like protuberance below it. Dorsal 13—15. Anal 13—15. Pectoral 34—47, the first 9 to 11 rays separate, the others contiguous or joined by membrane near the base; some of the rays may bear luminous expansions. Pelvic 18—26, above lateral photophores, equidistant from end of snout and base of caudal, or nearer caudal. Generally a white spot behind pelvic fin.

Caribbean Sea. Gulf of Mexico. Atlantic. Mediterranean.

Here described from a specimen from Messina, 46 mm in length to base of caudal, lent to us by Dr. Vinciguerra, and four, 36 to 62 mm. long, from Stations 45, 156. 1185 and 1378, with 300 to 1000 metres of wire out. Twelve others, 15 to 20 mm. in length to base of caudal, are from Stations 884, 1020, 1040, 1060, 1061, 1157, 1225, 1229, 1231, 1253, and 1342, with 25 to 1000 metres of wire out; except for counts of fin-rays they are not included in the description. In three specimens the photophore counts are; — ventral, I.-P. 4—5; P.-V. 12—13; V.-A. 11—12; A.-C. 5; lateral, O.-V. 13; V.-A. 9—12.

3. BATHOPHILUS PROXIMUS, sp. n. (Pl. III, fig. 3).

Depth of body 6 in the length, length of head 5. Postocular organ large. Dorsal 16. Anal 16. Pectoral 16—19. Pelvics 16-rayed, inserted above lateral photophores, and a little nearer to end of snout than to base of caudal. Photophores in ventral series P.-V. 13; V.-A. 13; A.-C. 5; in lateral series O.-V. 10; V.-A. 10.

Atlantic, W. of Bermuda.

A single specimen, 55 mm. in length to base of caudal, from Station 1353, with 1000 metres of wire out.

4. BATHOPHILUS LONGIPES, sp. n. (Pl. IV, fig. 3).

Depth of body $6^1/_2$ to 10 in the length, length of head $4^1/_2$ to 6. Postocular organ large; a small white spot in front of it. Dorsal 13—16. Anal 13—16. Pectoral 10—16 (3—6 + 7—11), Pelvics of 7 to 10 rays, equidistant from eye or postocular part of head and base of caudal.

Atlantic; Gulf of Mexico; Caribbean Sea.

Sixteen specimens, 24 to 105 mm. in length to base of caudal, from Stations 950, 1060, 1147, 1148, 1184, 1215, 1216, 1217, 1223, 1229, 1230, 1231, 1253, 1266, and 1273, with 300 to 1000 metres of wire out.

In one specimen the ventral photophores number: I.-P. 5; P.-V. 17: V.-A. 11; A.-C. 5; in three the lateral photophores are; O.-V. 14—16; V.-A. 9—10.

5. BATHOPHILUS SCHIZOCHIRUS, sp. n. (Pl. IV, fig. 2).

Depth of body $7^1/_2$ in the length, length of head 5. Postocular organ well separated from eye. Dorsal 14. Anal 15. Pectoral 3 + 4. Pelvics of 19 or 20 rays, a little nearer to base of caudal than to end of snout. Photophores in ventral series, I.-P. 5; P.-V. ca. 14; V.-A. 11, the last 3 or 4 close together; A.-C. 5; lateral, O.-V. 13—14; V.-A. 8—9.

Caribbean Sea.

A single specimen, 72 mm. in length to base of caudal, from Station 1239, with 1000 metres of wire out. A specimen of 20 mm. from Station 1065 (65 M.W.) probably belongs to the same species. D. 15; A. 16; P. 3 + 5; Pv. 16.

6. BATHOPHILUS DIGITATUS, Welsh, 1923.

Dactylostomias digitatus, Welsh, Proc. U. S. Nat. Mus., LXII, (3) p. 9, fig. 9.

Depth of body 11 in the length, length of head $5^4/_5$. Postocular luminous organ with a rounded white spot in front of it. Dorsal 14. Anal 15. Pectoral 3 + 4. Pelvics 9-rayed, nearer to base of caudal than to end of snout (according to the figure nearer caudal fin than head). Photophores O.-V. about 15.

225 miles W. of Bermuda.

Length of type 35 mm.

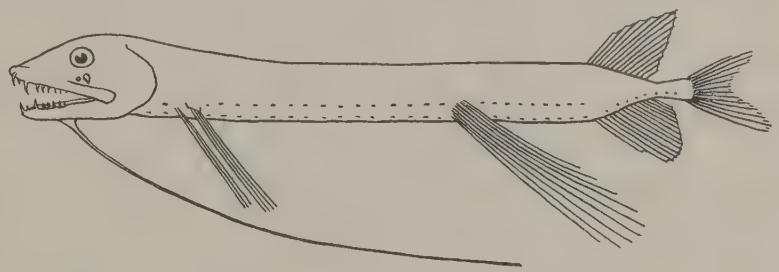


Fig. 45. *Bathophilus digitatus* (after Welsh).

7. BATHOPHILUS METALLICUS, Welsh, 1923. (Pl. IV, fig. 1).

? *Trichostomias vaillanti*, Zugmayer, Rés. Comp. Sci. Monaco, XXXV. 1911, p. 78, pl. III, fig. 4.
Trichostomias metallicus, Welsh, Proc. U. S. Nat. Mus. LXII, (3), 1923, p. 11, fig. 10.
Bathophilus simplex, Parr, Bull. Bingham, Ocean. Coll. III, (2), 1927, p. 87, fig. 9.

Depth of body 7 to 11 in the length, length of head 4 to $5^1/_2$. Postocular luminous organ sometimes with an elongate luminous patch below it. Dorsal 13—16. Anal 14—17. Pectoral 2 + 1, the first two rays adherent, the third isolated, sometimes with a small additional ray at its base. Pelvics of 4 to 6 rays, equidistant from end of snout and some part of anal fin. Photophores in ventral series I.-P. 5; P.-V. 13—15; V.-A. 16—20; A.-C. 6—7; in lateral series O.-V. 12—14; V.-A. 14—17.

Atlantic, north of 20° N.

One hundred and fifty one specimens, 25 to 140 mm. in length to base of caudal, from Stations 823, 827, 828, 830, 835, 857, 858, 877, 878, 882, 910, 925, 1011, 1015, 1031, 1044, 1056, 1057, 1059, 1067, 1072, 1107, 1108, 1110, 1113, 1116, 1141, 1142, 1145, 1146, 1147, 1152, 1153, 1241, 1326, 1327, 1335, 1337, 1339, 1341, 1342, 1345, 1353, 1356, 1358, 1362, 1363, 1365, 1366, 1367, 1368, 1369, 1370, 1372, 1377 and 1379, with 10 to 7000 metres of wire out.

Parr distinguished *B. simplex* from *B. metallicus* by the absence of a luminous patch below the postocular organ and by the coloration being dull blackish instead of metallic. We find both dull and

lustrous specimens with and without the patch, which when present is very variable, often reduced to a faint streak, but sometimes large and ovate. *Bathophilus vaillanti* is probably this species, but was described as having 11 dorsal and 12 anal rays.

8. BATHOPHILUS LONGIPINNIS, Pappenheim, 1914. (Pl. V, fig. 1).

Melanostomias longipinnis, Pappenheim, Deutsch. Südpolar-Exp., Tiefseefische, p. 170, fig. 1.
Gnathostomias longifilis, Pappenheim, t. c. p. 172.

Depth of body $6^1/_2$ to 8 in the length, length of head 4 to 5. Postocular organ with a small white spot well in front of it, under eye. Dorsal 14—16. Anal 15—16. Pectoral 6—8, the first three rays stronger than the rest. Pelvics of 11 to 14 rays, nearer to base of caudal than to end of snout.

Atlantic; Caribbean Sea.

Six specimens, 26 to 110 mm. in length to base of caudal, from Stations 904, 935, 1016, 1058, 1231 and 1366, with 65 to 1000 metres of wire out. The pelvic fins have 11 rays in two, 12 in three, and 14 in one. In three specimens the lateral photophores number, O.-V. 13—16; V.-A. 10—12.

The types of *Melanostomias longipinnis* (26 mm. long to base of caudal) and *Gnathostomias longifilis* (47 mm.) have been examined in Berlin by the junior author. Both were taken in the same locality (24° N. 32° W.) and they seem to belong to one species, to which also belong the specimens described above.

9. BATHOPHILUS ATER, A. Brauer, 1902.

Dactylostomias ater, Brauer, Valdivia Tiefseefische, p. 57, pl. III, fig. 3. (1906).

Depth of body 8 in the length, lengt of head $5^1/_2$. Postocular luminous organ with a luminous spot in front of it and an oblong patch below it. Dorsal 17. Anal 17. Pectoral 5, the first two rays

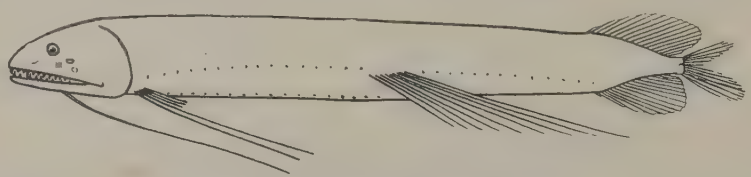


Fig. 46. *Bathophilus ater* (after Brauer).

longer and stronger than the rest and a little separate from them. Pelvics 9-rayed, a little nearer to base of caudal than to end of snout. Photophores P.-V. 18; O.-V. 16; V.-A. 13—15.

Atlantic, off S. Africa.

Described by the junior author from the type in Berlin; length 83 mm. to base of caudal (end of snout to pelvics 43 mm.).

10. BATHOPHILUS INDICUS, A. Brauer, 1902.

Dactylostomias indicus, Brauer, Valdivia Tiefseefische, p. 58 (1906).

Distinguished from *B. ater* by the number of pelvic rays. Dorsal 13. Anal 16. Pectoral 4. Pelvic 16.
Indian Ocean.
Length of type, 37.5 mm. to base of caudal (end of snout to pelvics 20 mm.).
The type was cut into sections by Brauer.

11. BATHOPHILUS PAWNEEI, Parr, 1927.

Bull. Bingham Ocean. Coll. III, (2), p. 88, fig. 51.

Depth of body $6^1/_2$ to $9^1/_2$ in the length, length of head 5 to $6^2/_3$. Postocular luminous organ with a small luminous patch in front of it, or below its anterior end. Dorsal 14—17. Anal 15—18. Pectoral 2. Pelvics of 11 to 13 rays, a little nearer to end of snout than to base of caudal. Generally a

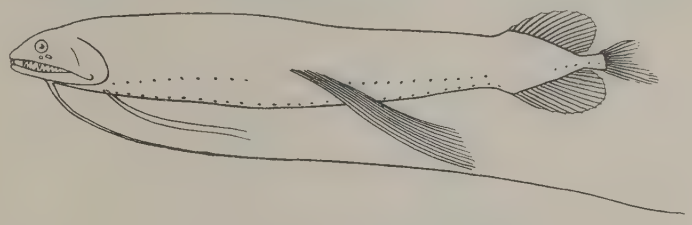


Fig. 47. *Bathophilus pawneei* (after Parr).

small luminous spot behind pelvic fin, and sometimes one on shoulder. In two specimens photophores in ventral series P.-V. 12; V.-A. 14; A.-C. 6.

Western and mid-Atlantic; Caribbean Sea.

One hundred and six specimens, 20 to 116 mm. in length to base of caudal, from Stations 849, 913, 923, 925, 927, 929, 1166, 1171, 1181, 1182, 1183, 1184, 1185, 1189, 1191, 1192, 1198, 1253, 1256, 1266, 1268, 1269, 1270, 1272, 1273, 1274, 1278, 1279, 1280, 1281, 1283, 1285, 1288, 1289, 1291, 1292, 1293, 1294, 1314 and 1332, with 100 to 3000 metres of wire out.

12. BATHOPHILUS MELAS, sp. n. (Pl. V, fig. 2).

Depth of body 8 in the length, length of head 5. Postocular luminous organ with an oblique white spot in front of and below its anterior end. Dorsal 14. Anal 14—15. Pectoral 2. Pelvics of 9 or 10 rays, a little nearer to base of caudal than to end of snout; no spot behind them. Colour deep black.

N. E. Providence Str., Bahamas.

Two specimens, 33 and 20 mm. in length to base of caudal, from Station 1239, with 600 metres of wire out.

13. BATHOPHILUS CHIRONEMA, sp. n. (Pl. V, fig. 3).

Depth of body 7 to 9 in the length, length of head 5 to $5^2/_3$. Postocular luminous organ with a round white spot in front of it, below eye. Dorsal 14—16. Anal 15—16. Pectoral 2. Pelvics of 6 to 8 rays, nearly equidistant from end of snout and base of caudal. Photophores in ventral series I.-P. 5; P.-V. 15; V.-A. 12—13; A.-C. 5—7; in lateral series O.-V. 14—15; A.-C. 12—13. Generally a small luminous spot behind pelvic fin.

Atlantic.

Five specimens, 29 to 53 mm. in length to base of caudal, from Stations 837, 1041, 1236, 1335 and 1341, with 150 to 300 metres of wire out.

14. BATHOPHILUS FILIFER, Garman, 1899.

Dactylostomias filifer, Garman, Mem. Mus. Comp. Zool. XXIV, p. 279, pl. LVI, fig. 6.

Depth of body 9 to 12 in the length, length of head 5 to $6^1/_2$. Postocular luminous organ with a luminous spot below it. Dorsal (12) 13—16. Anal 14—17. Pectoral of a single long ray. Pelvics of 4 or 5 rays, nearly equidistant from end of snout and base of caudal, nearer ventral profile than in other species.

Pacific, off Central America and Galapagos.

Twenty-six specimens, 25 to 81 mm. in length to base of caudal, from Stations 1203, 1205, 1206, 1208 and 1209, with 500 to 4500 metres of wire out.

Fig. 48. *Bathophilus filifer* (after Garman).

10. **PACHYSTOMIAS,** Günther, 1878.

Challenger Deep Sea Fishes, p. 210 (1887).

Jaws rather slender; cleft of mouth slightly curved. Teeth in jaws uniserial, slender, curved, acute, unequal, but none very large; maxillary with small oblique teeth; teeth on palatines and pharyngeals; teeth on gill-arches. A fold of skin connecting the branches of the lower jaw behind the symphysis. Eye large; below it a large mass of luminous tissue, forming a cushion on each side of the roof of the palate, and appearing externally as a long white patch, with a smaller luminous patch above its anterior end; post-ocular luminous organ small, behind posterior end of lower subocular patch. Dorsal 21—24. Anal 25—27, beginning below origin of dorsal, ending a little farther back than dorsal. Pectoral 5—6. Pelvics 7-rayed, a little behind middle of length (about equidistant from eye and base of caudal).

1. PACHYSTOMIAS MICRODON, Günther, 1878.

Challenger Deep Sea Fishes, p. 210, pl. LIII, fig. C (1887).

Depth of body 5 in the length, length of head $4^2/_3$. Snout a little shorter than diameter of eye, which is 4 in length of head; interorbital width 6. Barbel slender, tapering, $^1/_4$ length of head. A close-set series of 5 backwardly directed teeth, the last the longest, on each palatine; a similar series on first basibranchial, a double series on second. Dorsal 24. Anal 27. Photophores in ventral series I.-P. 1 + 2 + 2 + 3, the last group beginning between the diverging pairs of the preceding; P.-V. 17; V.-A. 15, the last 5 in a close-set series above vent; A.-C. 9; in lateral series O.-V. 17 (2 + 4 + 4 + 7), the first 2 ascending obliquely from isthmus; V.-A. 14 (10 + 4), ending above vent.

Australia.

The type measures 215 mm. to base of caudal.

2. PACHYSTOMIAS ATLANTICUS, sp. n. (Pl. VI, fig. 1).

Depth of body 5 in the length, length of head $4^1/_2$. Snout a little shorter than diameter of eye, which is 4 in length of head; interorbital width 5. Barbel slender, tapering, $^2/_3$ length of head. Teeth in jaws longer than in *P. microdon*. Two teeth, the posterior the longer, on each palatine; two pairs on first basibranchial, four pairs on second. Dorsal 21. Anal 25. Photophores in ventral series I.-P. 1 + 2 + 2 + 3, the last group beginning between the diverging pairs of the preceding; P.-V. 16 (4 + 12); V.-A. 15 (10 + 5), ending about vent; A.-C. 9; in lateral series O.-V. 18 (2 + 4 + 4 + 8), the first two ascending obliquely from isthmus; V.-A. 13 (9 + 4), ending above vent.

Caribbean Sea, W. of St. Lucia.

A single specimen 165 mm. in length to base of caudal, from Station 1183, with 3500 metres of wire out.

Very near to *P. microdon*, but distinguished by the dentition, the broader interorbital region, and the longer barbel.

11. EUSTOMIAS, Vaillant, 1888.

Expéd. Travailleur et Talisman, Poiss. p. 112.
Neostomias, Gilchrist, Mar. Inv. S. Afr., IV, 1908, p. 168.

Form elongate. Cleft of mouth straight. Upper jaw protractile. Teeth in jaws slender, acute, not barbed, unequal, in a single series or an irregular double series; maxillary with a series of small oblique

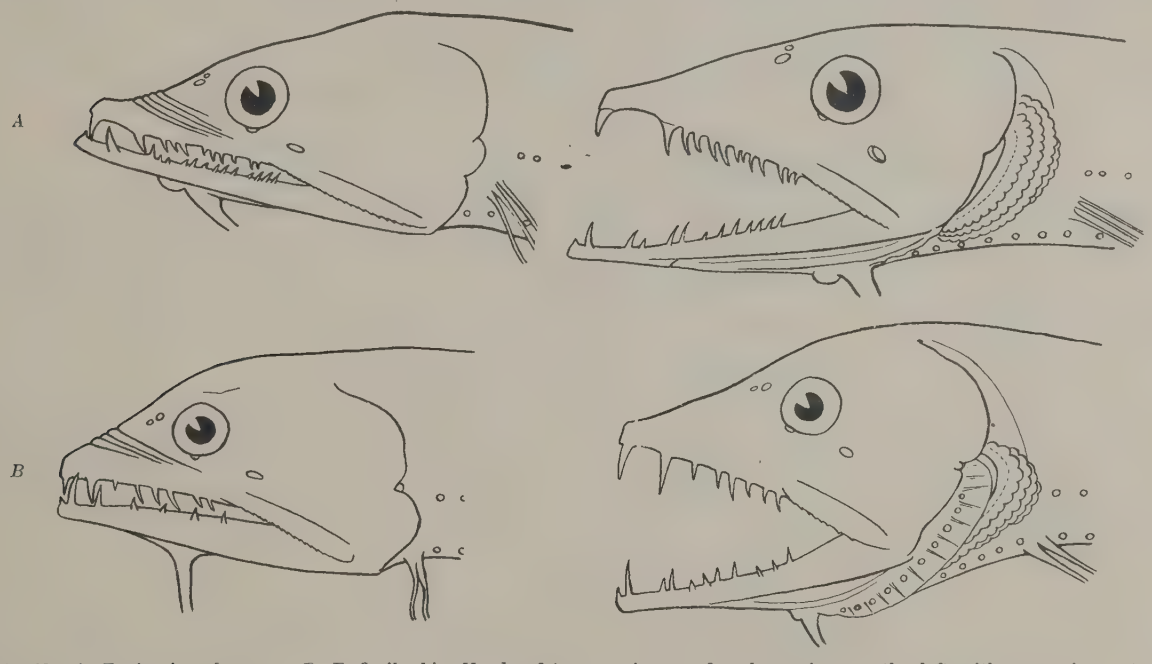


Fig. 49. *A. Eustomias obscurus*; *B. E. fissibarbis*. Heads of two specimens of each species, on the left with upper jaw retracted, on the right with it protracted.

teeth; palate toothless; 3 pairs of teeth on basibranchials, none on gill-arches. Dorsal 20—30. Anal 32—46, extending forward in advance of dorsal. Pectoral 0—13. Pelvics 7 or 8-rayed, inserted in or behind middle of length.

The species of this large and diverse genus fall into sub-genera according to the structure of the barbel, the number of rays in the paired fins, and the nature of the dentition. The differences in dentition, although important, are scarcely sufficiently definite to permit of division into several genera; within the same species there is some variation in the number of teeth, and it sometimes happens that a tooth that is fixed in the adult may be depressible in the young.

The first two teeth in the upper jaw are generally more or less enlarged fangs which may be either fixed or depressible; the first tooth in the lower jaw is always small and fixed and the second is a fang, either fixed or depressible, opposed to the interspace between the first and second teeth of the upper jaw. Behind the anterior fangs in each jaw is a series of teeth, generally divided into fixed and depressible in varying numbers, the tendency being for the depressible teeth to form an inner series, often

divided into groups of teeth increasing in length backwards, and for the smaller outer fixed teeth to be placed at the gaps between these groups.

The sub-genera may be defined as follows:—

1. **SPILOSTOMIAS**, subgen. nov. (type *E. braueri*, Zugmayer).

Barbel unbranched, or with a pair of filaments just proximal to bulb. Pectoral of 10 to 13 long filamentous rays; pelvics 8-rayed, in middle of length. Teeth mostly fixed; second in upper jaw depressible in young; third and fifth in lower jaw depressible. Interorbital width 5 to $6^1/_2$ in head. Dorsal 22 -30. Anal 36—41. Two species (1, 2).

2. **UROSTOMIAS**, subgen. nov. (type *E. macrurus*, sp. n.).

Barbel unbranched. Pectoral of 9 rays. Pelvics 7-rayed, in middle of length. Teeth few, fixed, except fourth in upper jaw and third and fifth and sometimes sixth, in lower, which are depressible; second upper fang strong. Interorbital width 5 to 6 in head. Dorsal 25—29. Anal 45. One species (3).

3. **HAPLOCLONUS**, subgen. nov. (type *E. enbarbatus*, Welsh).

Barbel with a simple tapering branch a little proximal to bulb. Pectoral of 3 or 4 rays; pelvics 7-rayed, behind middle of length, reaching vent or anal fin. Teeth few, fixed, except fourth in upper jaw, which is movable or depressible, and third and fifth, and sometimes sixth, in lower jaw, which are depressible; second upper fang strong. Interorbital width $5^1/_2$ to 7 in head. Dorsal 21—23. Anal 34—37. Five species (4—8).

4. **EUSTOMIAS**, Vaillant (type *E. obscurus*, Vaill.).

Barbel unbranched. Pectoral of 3 rays; pelvics 7-rayed, behind middle of length, reaching vent or origin of anal. First tooth in upper jaw and second in lower fixed fangs projecting somewhat forwards and outwards, separated by a rather wide gap from the next tooth, which is not larger, is depressible, and is followed by a series of depressible teeth and 1 or 2 outer fixed teeth. Interorbital width 8 to 13 in length of head. Dorsal 23—30. Anal 34—46. One species (9).

5. **NOMINOSTOMIAS**, subgen. nov. (type *E. bibulbosus*, Parr).

Barbel unbranched. Pectoral of 2 or 3 rays; pelvics 7-rayed, more or less behind middle of length, reaching vent or anal fin. First tooth in upper jaw and second in lower fixed; second fang in upper jaw either fixed or depressible, generally larger than first; behind these anterior fangs in both jaws a series of depressible teeth and a few small outer fixed teeth. Interorbital width 6 to 8 in length of head. Dorsal 21—26. Anal 33—40. Twenty species (10—29).

6. **RHYNCHOSTOMIAS**, subgen. nov. (type *E. parri*, sp. n.).

Barbel unbranched. Pectoral of 4 or 5 rays; pelvics 7-rayed, behind middle of length. Teeth rather numerous, depressible, except a few small outer teeth. Interorbital width 6 in length of head. Dorsal 24. Anal 42. One species (30).

7. **ACHIROSTOMIAS**, subgen. nov. (type *E. lipochirus*, sp. n.)

Barbel unbranched. No pectoral; pelvics 7-rayed, behind middle of length. Teeth rather few, depressible, except a few small outer teeth. Interorbital width $5^1/_2$ to 6 in length of head. Dorsal 24—25. Anal 38—42. Three species (31—33).

8. TRICLONOSTOMIAS, subgen. nov. (type *E. drechseli*, sp. n.).

Barbel with three posterior branches, the median arising from between a pair. Pectoral of 6 or 7 rays; pelvics 8-rayed, a little behind middle of length. Teeth numerous, all depressible, except a few small outer fixed teeth. Interorbital width 6 to $6^1/_2$ in length of head. Dorsal 24—25. Anal 41—45. Three species (34—36).

9. DINEMATOCHIRUS, subgen. nov. (type *E. fissibarbis*, Papp.).

Barbel typically with three posterior branches, the median arising from between a pair, sometimes with one branch only. Pectoral of 2 rays; pelvics 7-rayed, behind middle of length, not reaching anal. First tooth in upper jaw usually fixed, second generally larger, depressible; second tooth in lower jaw fixed except in *E. silvescens*; behind these in each jaw a series of depressible teeth and a few outer fixed teeth. Interorbital width 4 to $5^1/_2$ in length of head. Dorsal 22—26. Anal 36—46. Twelve species (37—48).

10. NEOSTOMIAS, Gilchrist (type *E. filifer*, Gilchr.).

Barbel with three posterior branches, the median arising from between a pair. Pectoral of a single ray, and sometimes a minute second ray; pelvics 7-rayed, a little behind middle of length, not reaching anal. Teeth fewer than in *Triclonostomias*, all depressible except a few small outer fixed teeth. Interorbital width 5 to 6 in length of head. Dorsal 22—25. Anal 37—45. Four species (49—52).

In 1916 (Regan, "Terra Nova" Larval and Post-Larval Fishes, p. 136, pl. V, fig. 1), a curious larval or post-larval fish, 33 mm. long, was described as *Stylophthalmus macrenteron*, and it was suggested that this might be a *Eustomias*. The probability that this is so is greatly increased by the discovery that several species of *Eustomias* have a similar series of dark spots along the back. These spots are generally paired and are situated beneath the skin, on the muscles, but are visible in small specimens that have faded through exposure to light. We have found a series of 7 spots, similar in position to those of *Stylophthalmus macrenteron*, in *Eustomias stigmatopleura*, *bituberatus*, *simplex*, and *triramis*, 6 in *E. enbarbatus*, 9 or 10 in *E. dubius*, *polyaster*, *brevibarbatus*, *trituberatus*, *globulifer*, and *variabilis*.

In the subgenera *Dinematochirus* and *Neostomias* generally there are no spots, but there is a series of 7 in *E. triramis* and in one example of *E. paucifilis* the remnants of such a series, namely 5 small spots with a long gap between the fourth and fifth. In *E. enbarbatus*, with six spots, the second to fifth

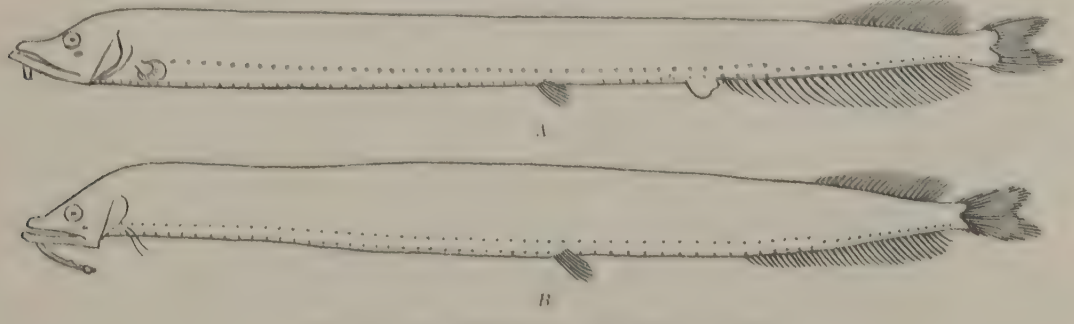


Fig. 50. Young *Eustomias*. *A*. 48 mm.; *B*. 57 mm.

are made up of four each, 2 median and one on each side; remains of three such groups can be seen in *E. barbuva* and of one in *E. acinosus*.

The distinction of the species of *Eustomias* is complicated by the fact that young specimens may

differ considerably in structure from the adults, that the juvenile characters may be retained up to a length of 70 mm. or more, and that in the same species specimens with the structure of young fish may be as large as, or even larger than, others with the structure characteristic of adults, as is well shown by *E. polyaster* and *E. schmidti*. This indicates either that there may be considerable variation in the size at which the adult form is reached, or that a decrease in size takes place at some stage of the development.

The features that distinguish the young fish are a small head, feeble teeth, short paired fins, and a barbel not fully developed. To these may be added, at least in some species, a body different in form from that of the adult, deepest near the middle of the length instead of just behind the head. Parr has given the specific names *micropterygius* and *microcephalus* to two such juvenile fish, 57 and 66 mm. long, that may be young examples of *E. macrophthalmus* and *E. longibarba* respectively.

The "Dana" collection includes the following young examples of *Eustomias*, all but the first having the skin pigmented, photophores developed, and pelvic fins present.

1. 36 mm. (St. 812, 29° 20′ N. 40° 23′ W.). Very similar to *Stylophthalmus macrenteron*, but no spots, protruding gut somewhat shorter.

2. 48 mm. (fig. 50, A). (St. 1142, 300 M.W.). D. 24; A. 34. O.-V. 31. V.-A. 15—16; A.-C. 17. End of gut protruding. Barbel rudimentary. Pectoral of larval type.

3. 57 mm. (fig. 50, B). (St. 1217, 2500 M.W.). D. 22; A. 34. P. 2. O.-V. 34; V.-A. 15; A-.C. 16. Body deepest a little before pelvic fins. Barbel shorter than head; pigment on proximal part of bulb; a rudiment of a posterior branch. Probably belongs to the sub-genus *Dinematochirus*.

4. *E. stigmatopleura*. 58 mm. (see p. 78).

5—7. *E. obscurus*. 52—57 mm. (see p. 82).

8. *E. dubius*. 72 mm. (see p. 88).

9. *E. bituberatus*. 65 mm. (see p. 83).

10. *E. melanonema*. 85 mm. (see p. 86).

11—12. *E. polyaster*. 65 mm. (see pp. 89, 91).

13. *E. schmidti*. 70 mm. (see p. 101).

14. *E. fissibarbis*. 50 mm. (see p. 104).

15. *E. monodactylus*. 58 mm. (see p. 108).

Synopsis of the Species.

I. Stem of barbel unbranched, or with simple tapering branch just proximal to bulb, or a pair of filaments at base of bulb.

A. Teeth in upper jaw fixed; in lower fixed except fourth and sixth, which are depressible. P. 10—13; Pv. 8.

A pair of minute filaments, or none, immediately proximal to bulb of barbel . . . 1. *braueri*.

A pair of long filaments immediately proximal to bulb of barbel . . . 2. *stigmatopleura*.

B. Teeth few, mostly fixed; fourth in upper jaw movable or depressible, third and fifth in lower, and sometimes sixth, depressible. P. 3—9. Pv. 7.

1. P. 9; barbel unbranched . . . 3. *macrurus*.

2. P. 3—4; barbel with simple tapering branch proximal to bulb.

α. Bulb without appendage bearing several stalked small oval or club-shaped bodies.

Median terminal filament about as long as bulb . . . 4. *brevifilis*.

Median terminal appendage at least twice as long as bulb . . . 5. *enbarbatus*.

β. Bulb with appendage resembling a bunch of grapes, having numerous stalked small oval or club-shaped bodies on a stem.

Median terminal appendage short, swollen at end . . . 6. *acinosus*.

Median terminal appendage 1/10 length of barbel, branched .... 7. *barbuva.*

Median terminal appendage 1/5 length of barbel, branched .... 8. *botrypogon.*

C. Anterior fangs (first tooth in upper jaw, second in lower) fixed; second in upper jaw fixed or depressible; behind these in both jaws a series of depressible teeth and a few smaller outer fixed teeth. P. 2—3; Pv. 7. Barbel unbranched.

1. Second praemaxillary fang not longer than first, separated from it by a rather wide gap. P. 3. Photophores of lateral series partly in pairs ..... 9. *obscurus.*

2. Second praemaxillary fang generally longer than first, separated from it by a relatively narrow interspace. Photophores evenly spaced.

α Pectoral of 3 rays.

* Barbel with 2 bulbs.

† Barbel with long tapering terminal appendage, generally unbranched except proximally.

Terminal appendage without filamentous branches ..... 10. *bibulbosus.*

Terminal appendage with 1 to 3 simple filaments near base .. 11. *bituberatus.*

Terminal appendage with 4 to 8 filaments near base, these beaded or with terminal swellings ..... 12. *micraster.*

†† Barbel with branched terminal appendage.

Terminal appendage at least 1/2 length of head, with 2 to 4 main branches in distal half ..... 13. *bimargaritatus.*

Terminal appendage less than 1/3 length of head, richly branched 14. *arborifer.*

††† Barbel with 5 to 8 pigmented filaments at end of distal bulb.

Distal bulb rounded or ovate, with basal pigment spot; filaments on a stalk ..... 15. *melanostigma.*

Distal bulb elongate, without pigment spot; filaments not stalked 16. *melanonema.*

** Barbel with one bulb.

Bulb with branched terminal appendage ..... 17. *patulus.*

Bulb with simple terminal appendage ..... 18. *longibarba.*

Bulb without appendage ..... 19. *simplex.*

β Pectoral of 2 rays.

* Barbel with a bulb divided by a distal notch into 2 unequal lobes, the longer tapering.

One bulb bearing two minute filaments ..... 20. *dubius.*

A small bulb proximal to main one, which bears a branched terminal appendage with bulb-like bodies in the stem ... 21. *polyaster.*

** Barbel with 2 to 4 separate bulbs, none bilobed.

Two well-separated bulbs, sometimes with 1 or 2 smaller ones between ..... 22. *variabilis.*

Three bulbs, the middle very near the distal one, which is larger 23. *trituberatus.*

Two bulbs near together, the distal larger ..... 24. *brevibarbatus.*

*** Barbel with one bulb, sometimes divided, but if so the two parts contiguous.

Bulb divided into a proximal slender and distal broadly rounded part ..... 25. *xenobolus.*

Bulb pear-shaped, with distal filament ..... 26. *pyrifer.*

Bulb small, oval, with broad, blunt distal appendage ..... 27. *globulifer.*

Bulb elongate, with minute terminal filament; barbel as long as fish ..... 28. *macrophthalmus.*

Bulb elongate, with small filament; barbel 1/2 as long as fish . 29. *leptobolus.*

D. Teeth all depressible, except a few small fixed outer teeth; barbel unbranched. Pv. 7.

1. Pectoral of 4 or 5 rays . . . . . 30. *parri.*

2. No pectoral fins.

Axis of barbel unpigmented, except a proximal streak; corner of distal edge of bulb produced . . . . . 31. *dactylobolus.*

Axis pigmented nearly to bulb, which has a slight corner . . . . 32. *lipochirus.*

Axis pigmented to bulb, which contains a black body . . . . . 33. *melanobolus.*

II. Stem of barbel with at least one posterior branch, usually with three, the median originating from between two lateral. Anterior fangs fixed or depressible, followed by a series of depressible teeth and a few small fixed teeth.

A. Pectoral of 6 or 7 rays; pelvics 8-rayed. Anterior fangs depressible. Barbel with 3 branches.

Branches long, slender, divided distally . . . . . 34. *drechseli.*

Median branch divided distally; lateral branches simple filaments 35. *furcifer.*

Median branch undivided, with terminal bulb; lateral branches simple filaments . . . . . 36. *tenisoni.*

B. Pectoral of 2 well-developed rays; pelvics 7-rayed. Anterior fangs fixed either in upper or lower jaw, usually in both.

1. Barbel with 3 branches.

a. Lateral branches undivided.

Bulb small; lateral branches long . . . . . 37. *parvibulbus.*

Bulb large, with distal filaments; lateral branches moderate . . . 38. *bigelowi.*

Bulb large, without filaments . . . . . 39. *triramis.*

b. Lateral branches bifid, or at least each with a well-developed secondary branch.

α Stem distal to origin of branches translucent, with pigmented axis.

Branches moderate . . . . . 40. *paucifilis.*

Branches long, the median more than twice as long as main stem of barbel . . . . . 41. *silvescens.*

β Stem pigmented throughout.

Median branch a rather large bulb on a short stem . . . . . 42. *schmidti.*

Median branch slender, well-developed . . . . . 43. *macronema.*

Median branch a fine filament . . . . . 44. *frondosus.*

2. Barbel with one branch.

Branch dividing into 4 . . . . . 45. *binghami.*

Branch ending in a bulb and bearing two long bifid branches 46. *fissibarbis.*

Branch without bulb, bearing several branches . . . . 47. *dendriticus.*

Branch slender, simple, ending in a small bulb . . . . . 48. *monoclonus.*

C. Pectoral of a single well-developed ray, and sometimes a minute second ray; pelvics 7-rayed. Anterior fangs depressible. Barbel with 3 branches.

1. Branches similar, long, slender. 4 or 5 luminous swellings on stem beyond branches . . . . . 49. *tetranema.*

2. Median branch rather short, dissimilar in structure to lateral branches. 2 luminous swellings on stem beyond branches.

Lateral branches rather short, divided nearly to the base 50. *ramulosus.*

Lateral branches long, undivided, bearing a few filamentous branches . . . . . 51. *monodactylus.*

Lateral branches simple, tapering, with minute terminal swellings 52. *filifer.*

Sub-genus SPILOSTOMIAS.

Teeth fixed, except third and fifth in lower jaw, which are depressible (fig. 52, A). Barbel without branch, or with a pair of filaments immediately proximal to bulb. Interorbital width 5 to $6^1/_2$ in length of head. Paired fins long, with pigmented filamentous rays. Pectoral 10—13. Pelvics 8-rayed, in middle of length.

1. EUSTOMIAS BRAUERI, Zugmayer, 1911.

Rés. Camp. Sci. Monaco, XXXV, p. 72, pl. III, fig. 3.

Depth 13, head $6^1/_2$ in length. Barbel nearly as long as head; bulb with leaf-like appendage? Dorsal 22. Anal 36. Pectoral 10. Pelvic 8. Small white spots above and below lateral photophores.

Eastern Atlantic.

Total length of type 80 mm.

Two specimens received from Prof. Roule (Monaco Coll.) measure 85 and 95 mm. in length to base of caudal. They are dated 1911 and are from Stations 3078 and 3082. D. 27; A. 38; P. 11—12; Pv. 8; O.-V. 29; V.-A. 16; A.-C. 20. The bulb of the barbel is $^2/_5$ the length of the stem, and just proximal to it is a pair of minute filaments. We suspect that the "leaf-like appendage" of the type may be the damaged distal end of the bulb.

2. EUSTOMIAS STIGMATOPLEURA, sp. n. (Pl. VII, fig. 1).

Depth of body 9 to 12 in the length, length of head 6 to 8. Diameter of eye 6 to 8 in length of head, interorbital width $5^1/_2$ to $6^1/_2$. Barbel about as long as head, with large ovate bulb, and with a

Fig. 51. *A.* Barbel of *Eustomias stigmatopleura*. *B.* End of barbel of young *E. stigmatopleura*. *C.* Barbel of *E. braueri*.

pair of long tapering filaments arising posteriorly from just below the bulb; stem black, bulb and filaments white. Dorsal 28—30. Anal 37—41. Pectoral 12—13, $1^2/_5$ to $1^4/_5$ as long as head. Pelvics 8-rayed,

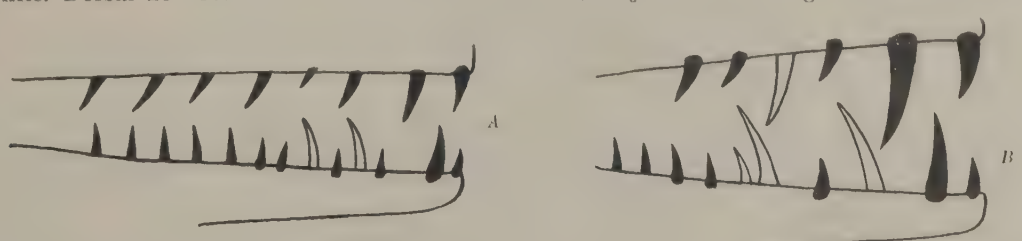


Fig. 52. Diagrams of dentiton of *A. Eustomias stigmatopleura*; *B. E. macrurus*. Fixed teeth black, depressible teeth unshaded.

inserted nearly in middle of length, nearly or quite reaching anal. Ventral photophores I.-P. 7; P.-V. 25—26; V.-A. 16; A.-C. 21—22; lateral, O.-V. 25—27; V.-A. 15—18. White spots, often more conspicuous than serial photophores, above and below the lateral and caudal series.

Atlantic; Caribbean Sea.

Four specimens, 62 to 116 mm. in length to base of caudal, from Stations 932, 1183 and 1322, with 150 to 4000 metres of wire out. An immature specimen, 58 mm., from Station 834 (M.W. 300) has no white spots on the side of the body, barbel with very short filaments (fig. 51, B), and pectoral fin less than $^1/_2$ the length of head.

Sub-genus UROSTOMIAS.

Teeth few, fixed, except fourth in upper jaw and third and fifth in lower, which are depressible; second upper fang strong (fig. 52, B). Barbel without branch. Interorbital width 5 to 6 in length of head. Pectoral 9. Pelvics 7-rayed, in middle of length.

3. EUSTOMIAS MACRURUS, sp. n. (Pl. VII, fig. 2).

Depth of body 13 to $15^1/_2$ in length, length of head 8 to 10. Diameter of eye 5 to $6^1/_3$ in length of head, nearly equal to interorbital width. Barbel as long as or a little longer than head, ending in an

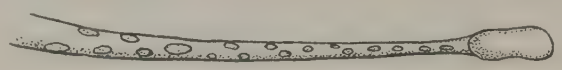


Fig. 53. *Eustomias macrurus*; barbel.

oblong bulb; stem white, with yellowish patches. Dorsal 25—29. Anal 45. Pectoral 9. Pelvics 7-rayed, inserted in middle of length, reaching vent. Tail long; dorsal and anal rays and caudal photophores rather widely spaced. Ventral photophores I.-P. 7; P.-V. 28—29; V.-A. 16—17; A.-C. 24—25; lateral O.-V. 29; V.-A. 16—18.

Atlantic.

Two specimens, 108 and 80 mm. in length to base of caudal, from Stations 912 and 1031, with 50 and 80 metres of wire out.

Sub-genus HAPLOCLONUS.

Teeth few, fixed, except fourth in upper jaw, which is either movable or depressible, and third and fifth, and sometimes sixth, in lower jaw, which are depressible; second upper fang strong (fig. 57, A). Barbel with a simple tapering branch a little below the bulb. Interorbital width $5^1/_2$ to 7 in head. Pectoral 3—4. Pelvics 7-rayed, behind middle of length, reaching vent or anal fin. Dorsal 21—23. Anal 34—37.

4. EUSTOMIAS BREVIFILIS, sp. n.

Depth of body $10^1/_2$ to $11^1/_2$ in the length, length of head 8 to $8^1/_3$. Diameter of eye 5 in length of head, interorbital width $6^1/_4$ to $6^1/_2$. Barbel from less than $^2/_7$ to $^1/_3$ length of fish; no pigment except

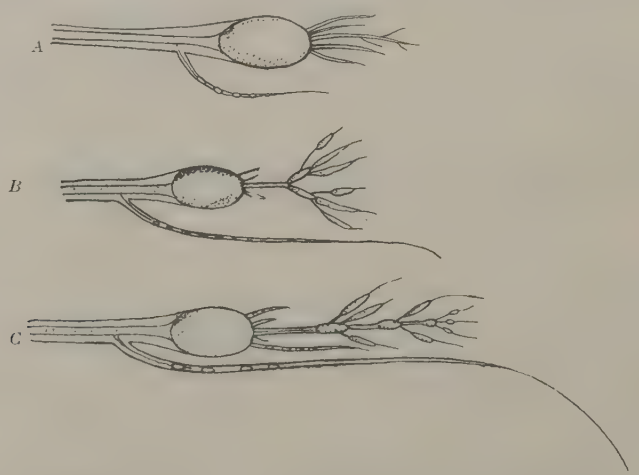


Fig. 54. End of barbel of *A. Eustomias brevifilis*; *B. C. E. enbarbatus.*

a spot at the base of the bulb, which is small, oval, and bears 4 or 5 terminal filaments, the longest branched, about as long as the bulb; branch from stem comparatively short. Dorsal 22. Anal 34—36. Ventral photophores, I.-P. 7; P.-V. 26—27; V.-A. 11—12; A.-C. 19—20; lateral, O.-V. 27—28; V.-A. 12.

Atlantic.

Two specimens, 83 and 105 mm. to base of caudal, respectively from Stations 1162 (M.W. 300) and 1165 (M.W. 1000).

5. EUSTOMIAS ENBARBATUS, Welsh, 1923.

Proc. U. S. Nat. Mus. LXII, Art. 3, p. 7, figs. 7, 8.

Depth of body $10^1/_2$ to $12^3/_4$ in the length, length of head 7 to 8. Diameter of eye 5 to 6 in length of head, interorbital width $5^1/_2$ to 6. Barbel $^2/_7$ to $^1/_3$ length of fish; bulb small, oval, with 4 short simple terminal filaments and one long branched one, the branches with luminous swellings. Dorsal 22—23. Anal 35—36. Ventral photophores I.-P. 7; P.-V. 26—27; V.-A. 12; A.-C. 19; lateral, O.-V. 26—27; V.-A. 13.

Atlantic.

Two specimens, 57 and 65 mm. to base of caudal, from Station 1322 (200 and 150 M.W.). The larger has the bulb pigmented along the edge opposite to the branch from the stem; the appendage is very similar to that of the type, except for an additional branch on each side, but the filaments on the bulb are shrunken. The smaller specimen has a pigment spot on the base of the bulb, and the appendage has a longer stalk with three luminous swellings, each bearing 2 or 3 branches.

6. EUSTOMIAS ACINOSUS, sp. n.

Depth of body $9^1/_2$ to $10^1/_2$ in length, length of head 7 to $7^2/_3$. Diameter of eye $5^1/_2$ to $6^1/_2$ in length of head, interorbital width $5^1/_2$. Barbel a little more than $^1/_4$ length of fish, with small rounded bulb bearing towards the distal end an appendage resembling a bunch of grapes, numerous stalked ovate

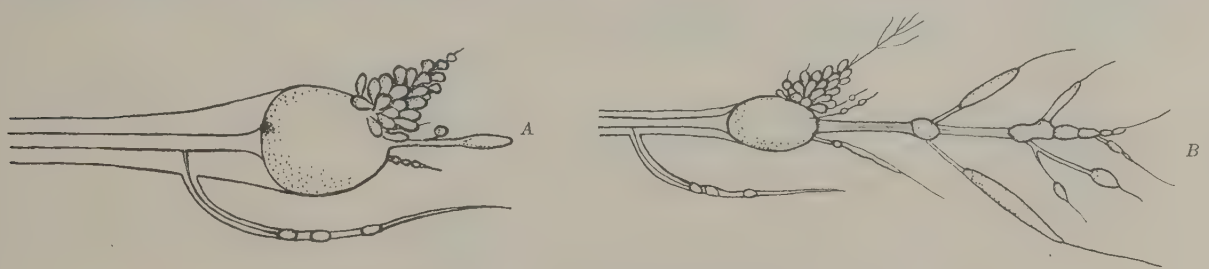


Fig. 55. End of barbel of *A. Eustomias acinosus*; *B. E. barbuva.*

bodies being attached to a stem; median terminal appendage of bulb short, swollen at end; a slender filament near it. Barbel without pigment except a spot at base of bulb. Dorsal 21—22. Anal 35—36. Pectoral 3. Pelvics inserted behind middle of length, nearly or quite reaching vent. Ventral photophores I.-P. 7; P.-V. 26—27; V.-A. 12; A.-C. 19—23; lateral, O.-V. 26—27; V.-A. 11—13.

Atlantic.

Two specimens, 114 and 62 mm. in length to base of caudal, from Stations 1030 and 1322, with 150 and 700 metres of wire out.

7. EUSTOMIAS BARBUVA, sp. n. (Pl. VII, fig. 3),

Depth of body 11 in the length, length of head $7^1/_2$. Diameter of eye 5 in length of head, interorbital width 5. Barbel unpigmented, more than $^2/_7$ length of fish; bulb ovate, with a "bunch of grapes" as in *E. acinosus*, but with a longer terminal appendage, about 4 times as long as the bulb, branched,

and with several swellings. Dorsal 24. Anal 36. Pectoral 3 right, 4 left. Ventral photophores I.-P. 7; P.-V. 27; V.-A. 12; A.-C. 19; lateral, O.-V. 27; V.-A. 13.

Atlantic.

A single specimen, 109 mm. in length to base of caudal, from Station 1031, with 150 metres of wire out.

Barbel 33 mm.; to bulb, 29 mm.; bulb, 3/4 mm.

8. EUSTOMIAS BOTRYPOGON, sp. n.

Depth of body 10 in length, length of head 7 2/3. Diameter of eye 5 1/3 in length of head, interorbital width 6 1/2. Barbel more than 1/2 length of fish; axis pigmented near the small ovate bulb, which bears a "bunch of grapes" and other appendages comparable to those of the two preceding species;

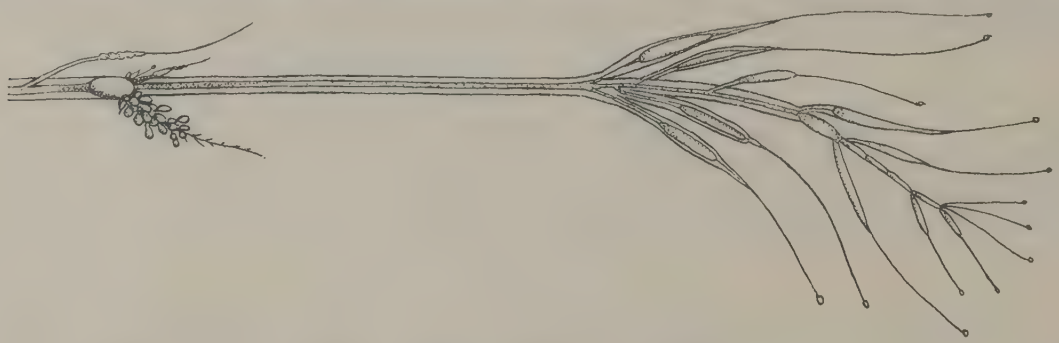


Fig. 56. *Eustomias botrypogon*; end of barbel.

median terminal appendage long, appearing as a continuation of the stem, distally with several branches, each with a proximal cigar-shaped swelling and a distal filament ending in a minute bulb. Dorsal 23. Anal 37. Pectoral 3. Ventral photophores I.-P. 7; P.-V. 27; V.-A. 12; A.-C. 20; lateral, O.-V. 27; V.-A. 12.

Atlantic.

A single specimen, 185 mm. in length to base of caudal, from Station 1158, with 500 metres of wire out.

Barbel 100 mm.; to bulb 80 mm.; bulb, 1 mm.

Sub-genus EUSTOMIAS.

Barbel unbranched. Anterior fangs (first tooth in upper jaw and second in lower) fixed, projecting somewhat forwards and outwards, separated by a rather wide gap from the next tooth, which is not larger and is depressible; behind this one or two fixed teeth followed by a series of depressible teeth.

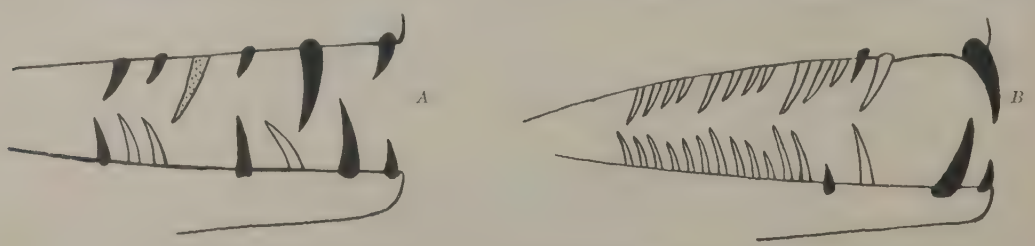


Fig. 57. Diagrams of dentition of *A. Eustomias botrypogon*; *B. E. obscurus*.
As in all diagrams of dentition, fixed teeth black, movable dotted, depressible unshaded.

Interorbital width less than diameter of eye, 8 to 13 in length of head. Pectoral of 3 unpigmented rays. Pelvics 7-rayed, inserted behind middle of length, reaching vent or origin of anal. Lateral photophores partly grouped in pairs.

9. EUSTOMIAS OBSCURUS, Vaillant, 1888. (Pl. VII, fig. 4).

Talisman et Travailleur Poiss. p. 113 pl. VIII figs. 3, 3 a.
Eustomias macrorhynchus, Pappenheim, Deutsch. Südpolar-Exped. Zool. XV, (7), 1914, p. 173, figs. 2, 3.
Eustomias proximus, Welch, Proc. U. S. Nat. Mus. LXII, 1923, p. 5, fig. 3, 4.
?*Eustomias zugmayeri*, Parr, Bull. Bingham Ocean. Coll. III, (2) 1927, p. 62.

Depth of body 12 to 20 in the length, length of head $7^1/_3$ to $9^1/_2$. Diameter of eye $4^1/_2$ to 7 in length of head, interorbital width 8 to 13. Barbel from less than $^1/_4$ to more than $^1/_2$ length of fish; stem

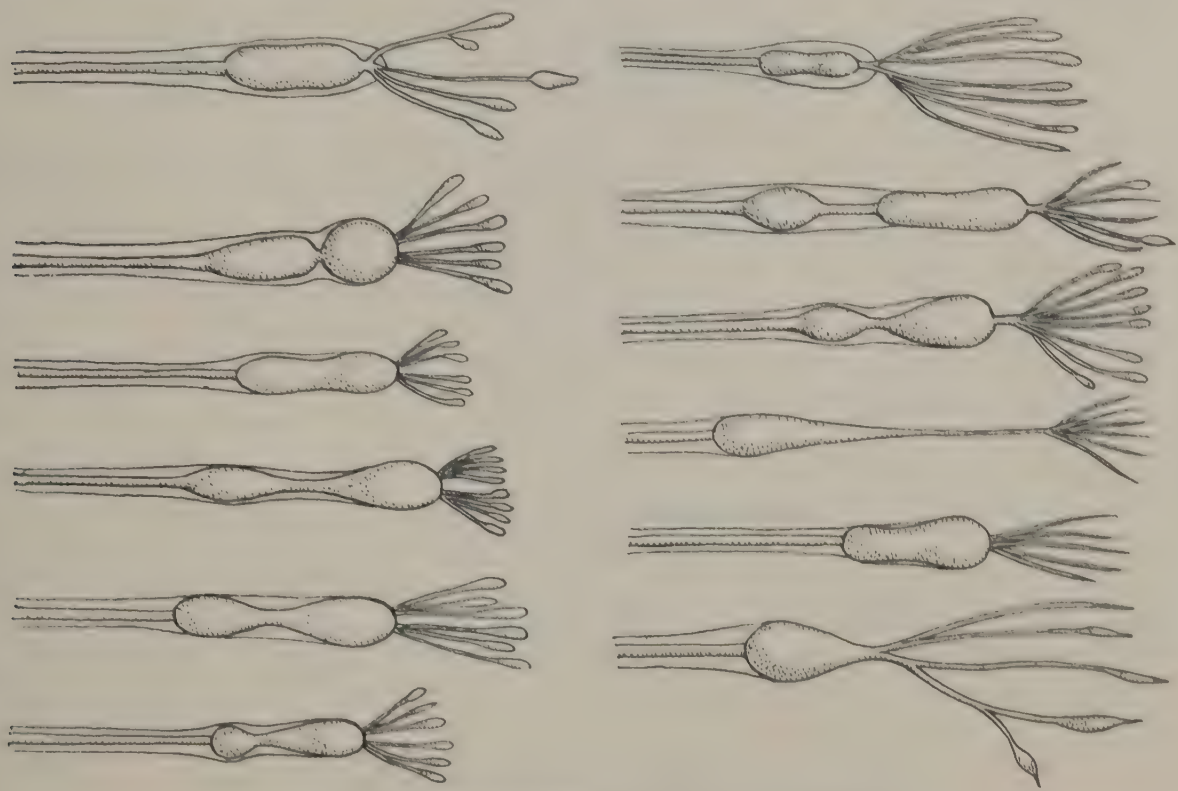


Fig. 58. *Eustomias obscurus*. End of barbel of 12 specimens.

unpigmented; bulb pear-shaped, ovate, or oblong, sometimes divided by a constriction; terminal filaments varying in number from 3 to 8, usually swollen at ends, either on a stalk or arising directly from bulb, often in two groups of 2 to 4. Dorsal 23—30. Anal 34—46. Pectoral 3. Pelvic 7. Photophores, O.-V. 30—37; V.-A. 15—18; A.-C. 19—22.

Atlantic.

191 specimens, from stations 399, 446, 662, 721, 774, 813, 830, 844, 855, 856, 858, 863, 865, 871, 883, 886, 888, 889, 890, 905, 907, 925, 932, 946, 950, 952, 1017, 1019, 1031, 1032, 1033, 1034, 1035, 1040, 1042, 1043, 1045, 1056, 1059, 1060, 1061, 1066, 1107, 1141, 1142, 1145, 1146, 1147, 1148, 1149, 1150, 1152,

1153, 1154, 1155, 1156, 1157, 1158, 1160, 1161, 1162, 1165, 1261, 1322, 1327, 1328, 1334, 1335, 1339, 1345, 1352, 1356, 1360, 1362, 1365, and 1378, with 25 to 5000 metres of wire out.

The variation in structure of the barbel is considerable; the majority of the specimens have a

Fig. 59. *Eustomias obscurus*; young fish 57 mm. long.

single slightly constricted bulb, as shown in fig. 58; but there are many deviations from this type. In addition the terminal filaments may be absent, but this is probably accidental, or in preserved specimens may be twisted together, having the appearance of a single digitiform appendage.

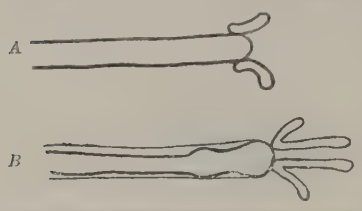


Fig. 60. *Eustomias obscurus*. End of barbel of two young fish. *A*. 57 mm., barbel 2 mm. *B*. 52 mm., barbel 6 mm.

Two specimens from stations 1261 (M.W. 2500) and 1365 (M.W. 300) respectively 55 and 57 mm. in length to base of caudal have the body deepest in the pelvic region, short paired fins, small head ($10^1/_2$ to 11 in length), and barbel little developed, less than $^1/_2$ length of head, without bulb and with a pair of small subterminal appendages (figs. 59, 60, A).

Another of 52 mm. from Station 1156 (M.W. 4000) is more advanced in structure; head 8 in length, barbel as long as head, with narrow constricted bulb and appendages terminal, bifid (fig. 60, B).

The types of *Eustomias macrohynchus* have been examined in Berlin by the junior author; they are examples of *E. obscurus*, but in poor condition. In the smaller (85 mm.) 40 anal rays were counted; in this specimen the bulb of the barbel bears only the stalk of the distal filaments, whereas in the larger (105 mm) the slightly constricted bulb bears a short stalk with two branches, one broken off, the other with 3 filaments twisted together.

Sub-genus NOMINOSTOMIAS

Barbel unbranched. Anterior fangs (first tooth in upper jaw, second in lower) fixed; second fang in upper jaw fixed or depressible, generally larger than first; behind these in both jaws a series of depressible teeth and a few small outer fixed teeth (figs. 67, 73). Interorbital width 6 to 8 in length of head. Pectoral of 2 or 3 rays. Pelvics 7-rayed, inserted more or less behind middle of length, reaching vent or anal fin. Dorsal 21—26. Anal 33—40.

10. EUSTOMIAS BIBULBOSUS, Parr, 1927.

Eustomias bibulbosus bibulbosus Parr, Bull. Bingham Ocean. Coll. III (2) p. 71.

Depth of body 12 to 13 in the length, length of head about 8. Diameter of eye nearly 5 in length of head, interorbital width 7 to 8. Barbel as long as fish; axis lightly pigmented; two bulbs, subequal or the distal the larger, separated by a distance 2 or 3 times the diameter of the larger; terminal appendage tapering, without branches, about twice as long as head. Dorsal 24—25. Anal 38. Pectoral 3. Ventral photophores I.-P. 7; P.-V. 30—32; V.-A. 18; A.-C. 17—18; lateral O.-V. 30—33; V.-A. 18—19.

Atlantic.

Two specimens, 132 and 136 mm. in length to base of caudal, from Stations 1322 and 1352, respectively with 1100 and 300 metres of wire out.

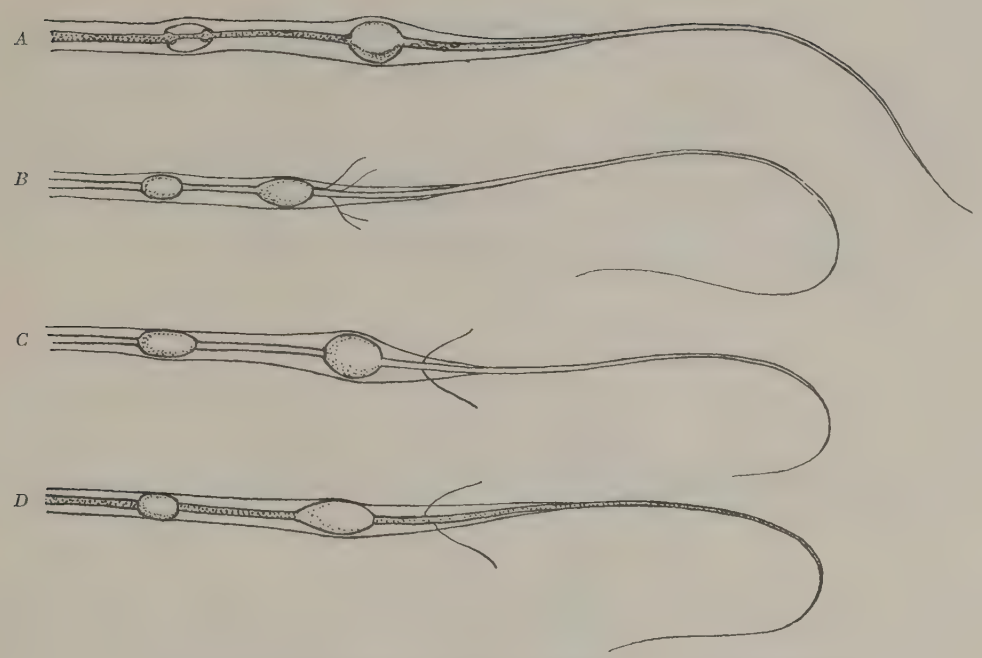


Fig. 61. End of barbel of *A. Eustomias bibulbosus*; *B. C, D, E. bituberatus.*

11. EUSTOMIAS BITUBERATUS, sp. n. (Pl. VIII, fig. 1).

Depth of body $11^2/_3$ to 13 in the length, length of head 7 to 9. Diameter of eye 5 to 6 in length of head, interorbital width 7 to 8. Barbel from nearly as long as to $1^3/_4$ length of fish; axis lightly pigmented; two bulbs, the distal the larger, separated by a distance greater than the diameter of either; terminal appendage tapering, $^7/_8$ to $1^2/_3$ as long as head, with 2 filamentous branches, rarely 1 or 3, near the base. Dorsal 25—26. Anal 36—40. Pectoral 3. Ventral photophores I.-P. 7—8; P.-V. 32—34; V.-A. 18—19; A.-C. 18—21; lateral O.-V. 31—34; V.-A. 18—19.

Atlantic; Caribbean Sea.

Five specimens, 82 to 133 mm. in length to base of caudal, from Stations 941, 1180, 1270 and 1284, with 300 to 700 metres of wire out. A comparison of the 3 larger specimens with *E. bibulbosus* shows the greater length of the barbel.

E. bituberatus,	133	mm.	barbel	220	mm.
—	115	-	—	170	-
—	114	-	—	194	-
E. bibulbosus,	136	-	—	115*	-
—	132	-	—	132	-
—	121	-	—	126	-

A specimen of 65 mm. from Station 1174 (M.W. 300) has juvenile characters. Body deepest in pelvic region; head small (10 in length); teeth feeble; paired fins short. Barbel 12 mm. to end of second bulb; terminal appendage short, with two branches.

* Terminal appendage incomplete.

12. EUSTOMIAS MICRASTER, Parr, 1927.

Eustomias bibulbosus micraster, Parr, Bull. Bingham Ocean Coll. III, (2) p. 72, fig. 41.

Depth of the body 10 to 12 in the length, length of head 7 to $8^1/_2$. Diameter of eye about 5 in length of head, interorbital width 7 to 8. Barbel from $^1/_2$ to nearly as long as fish; axis pigmented; two bulbs, sometimes subequal, but the distal usually the smaller, separated by a distance 2 to 4 times the dia-

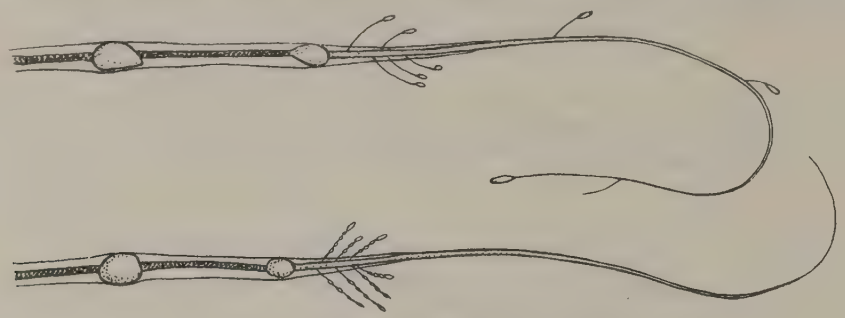


Fig. 62. *Eustomias micraster*; end of barbel.

meter of the larger; terminal appendage tapering, when complete once to nearly twice as long as head, with 4 to 8 branches near the base and rarely others further along; all the branches short filaments, generally with a terminal swelling and sometimes with a series. Dorsal 21—26. Anal 36—40. Ventral photophores I.-P. 7; P.-V. 30—32; V.-A. 17—19; A.-C. 18—21; lateral, O.-V. 30—33; V.-A. 17—19.

Western Atlantic; Caribbean Sea.

Six specimens, 68 to 95 mm. in length to base of caudal, from Stations 1184, 1186, 1189, 1195 and 1257, with 300 to 1000 metres of wire out.

13. EUSTOMIAS BIMARGARITATUS, sp. n.

Depth of body 11 to 15 in the length, length of head 7 to 8. Diameter of eye $4^2/_3$ to 6 in length of head, interorbital width $6^1/_2$ to $7^1/_2$. Barbel from less than $^1/_2$ to nearly $^3/_4$ length of fish; stem un-

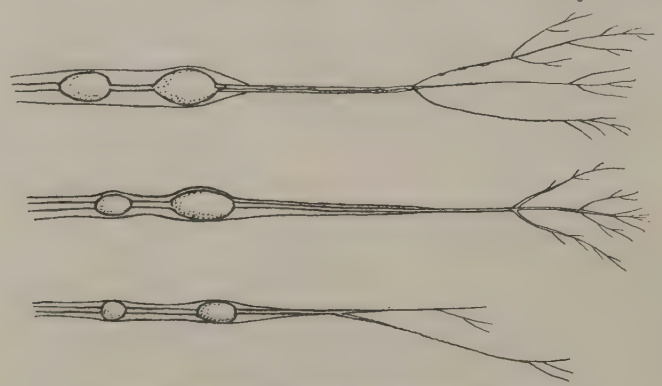


Fig. 63. *Eustomias bimargaritatus*; end of barbel.

pigmented; two bulbs, the distal the larger, separated by a distance which is rarely greater than the length of the larger bulb; terminal appendage from $^1/_2$ to a little longer than head, generally dividing at about half its length, sometimes further, into 3 filaments, rarely 2 or 4, which are generally branched. Dorsal

24—26. Anal 37—40. Ventral photophores I.-P. 7; P.-V. 32—34; V.-A. 17—18; A.-C. 18—21; lateral O.-V 33—34; V.-A. 17—19.

Atlantic.

Seven specimens, 70 to 92 mm. in length to base of caudal, from Stations 904, 924, 948, 950, 1195 and 1335, with 100 to 300 metres of wire out.

St. 1335, M.W. 300. Length to base of caudal 92 mm., barbel 65 mm.; terminal appendage 9 mm.

St. 950, M.W. 200. Length to base of caudal 87 mm.; barbel 60 mm.; terminal appendage 9 mm.

St. 924, M.W. 300. Length to base of caudal 70 mm.; barbel 32 mm.; terminal appendage 5 mm.

14. EUSTOMIAS ARBORIFER, Parr, 1927.

Eustomias bibulbosus arborifer, Parr, Bull. Bingham Ocean. Coll. III, (2) p. 72.

Barbel white, $^{3}/_{4}$ as long as fish; two bulbs, the distal the larger; interspace equal to length of distal bulb; terminal appendage less than $^{1}/_{8}$ length of head, richly branched, the main filament and the branches beaded. Dorsal 25. Anal 38. Pectoral 3. Ventral photophores I.-P. 8; P.-V. 33; V.-A. 17; A.-C. 19; lateral, O.-V. 33; V.-A. 18.

Western Atlantic.

Length of type, to base of caudal, 105 mm.; barbel 76 mm.; distal bulb, 1.5 mm.; terminal appendage, 4 mm.

15. EUSTOMIAS MELANOSTIGMA, sp. n. (Pl. VIII, fig. 2).

Depth of body $10^{1}/_{2}$ to 11 in the length, length of head 8. Diameter of eye nearly 6 in length of head, interorbital width 6. Barbel $^{3}/_{4}$ length of fish; stem unpigmented; two bulbs, the distal larger, rounded

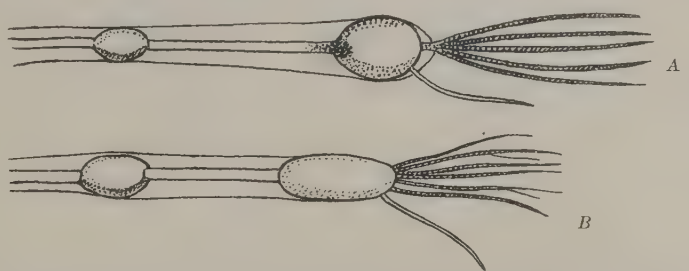


Fig. 64. End of barbel of *A. Eustomias melanostigma*; *B. E. melanonema.*

or ovate, separated from proximal by a distance twice its own length or somewhat more; a pigment spot at base of distal bulb, which bears 5 pigmented filaments on a short stalk, and sometimes a separate unpigmented filament. Dorsal 26. Anal 38. Pectoral 3. Ventral photophores I.-P. 7; P.-V. 31—33; V.-A. 19—20; A.-C. 19; lateral, O.-V. 30—33; V.-A. 20—21.

Caribbean Sea.

Two specimens. St. 1256, M.-W. 300. Length to base of caudal 106 mm.; barbel 80 mm.; proximal bulb 1 mm.; interspace 3 mm.; distal bulb $1^{1}/_{2}$ mm.; filaments $3^{1}/_{2}$ mm. St. 1266, M. W. 300. Length to base of caudal 95 mm.; barbel 72 mm.; proximal bulb 1 mm.; interspace 3 mm.; distal bulb $1^{1}/_{4}$ mm.; filaments $3^{1}/_{2}$ mm.

16. EUSTOMIAS MELANONEMA, sp. n.

Depth of body 13, length of head $8^{1}/_{4}$ in length. Diameter of eye $5^{1}/_{2}$ in length of head, interorbital width 6. Barbel $^{12}/_{13}$ length of fish; stem unpigmented; two bulbs, the distal oblong, nearly twice

as long as proximal, separated from it by a distance somewhat greater than its own length; six pigmented filaments arise together, but separately, from end of distal bulb; an unpigmented filament near them. Dorsal 26. Anal 37. Pectoral 3. Ventral photophores I.-P. 7; P.-V. 32; V.-A. 17; A.-C. 18; lateral, O.-V. 32; V.-A. 18.

Atlantic.

A specimen 91 mm. in length to base of caudal, from Station 1162, with 300 metres of wire out. Barbel 84 mm.; proximal bulb 1 mm.; interspace 2 mm.; distal bulb 1 3/4 mm. filaments 2 1/2 mm.

In the same haul a specimen of 85 mm. with small head (10 1/2 in length) and short paired fins, probably of this species but with juvenile characters. Eye 5, interorbital width 6 in head. Barbel 36 mm.; proximal bulb 1/2 mm.; stem between bulbs 2 mm., lightly pigmented; distal bulb 1 mm., bearing 8 pigmented filaments in 3 groups. D. 23; A. 37. I.-P. 7; P.-V. 33; V.-A, 18; A.-C. 20; O.-V. 33; V.-A. 18.

17. EUSTOMIAS PATULUS, sp. n.

Depth of body 11 in the length, length of head 7 1/2. Diameter of eye nearly 5 in length of head, interorbital width 8. Barbel 3/5 length of fish; axis lightly pigmented; bulb ovate, bearing a branched

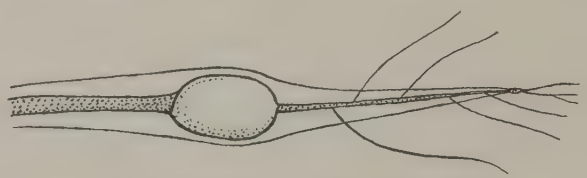


Fig. 65. *Eustomias patulus*; end of barbel.

terminal filament. Dorsal 24. Anal 35. Pectoral 3. Pelvics behind middle of length. Ventral photophores I.-P. 7; P.-V. 32; V.-A. 18; A.-C. 18; lateral, O.-V. 33; V.-A. 18.

Atlantic.

A single specimen, 135 mm. in length to base of caudal, from Station 1155, with 400 metres of wire out.

18. EUSTOMIAS LONGIBARBA, Parr, 1927.

Eustomias longibarbus, Parr, Bull. Bingham Ocean. Coll, III p. 64, fig. 35.

? *Eustomias microcephalus*, Parr, t. c. p. 75, fig. 43.

Depth of body 11 to 13 in the length, length of head 7 1/2 to 9. Diameter of eye about 5 in length of head, interorbital width 6 to 7. Barbel from a little less than 1/2 to 2/3 length of fish; axis of stem

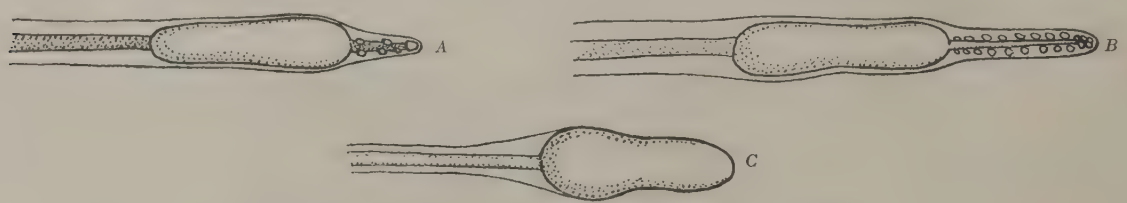


Fig. 66. End of barbel of *A*, *B. Eustomias longibarba*; *C. E. simplex.*

lightly or heavily pigmented, appearing nearly white or blackish; bulb elongate, with simple terminal appendage from about 1/4 to nearly as long as bulb, containing an axis bearing minute rounded bodies

within a translucent sheath. Dorsal 23—26. Anal 36—38. Pectoral 3. Ventral photophores I.-P. 7; P.-V. 33—34; V.-A. 17—19; A.-C. 18—20; lateral, O.-V. 32—35; V.-A. 17—18.

Atlantic; Caribbean Sea.

Four specimens.

St. 1043, M.W. 110. Length to base of caudal 61 mm.; barbel 33 mm.

St. 1148, M.W. 500. Length to base of caudal 70 mm.; barbel 32 mm.

St. 1217, M.W. 2000. Length to base of caudal 116 mm.; barbel 76 mm.

St. 1242, M.W. 300. Length to base of caudal 98 mm.; barbel 63 mm.

These agree better with PARR's description than his figure. He describes the bulb of the barbel as elongate, more than twice as long as broad, but his figure shows it as ovate and broader. The type of *E. microcephalus* is a specimen of 66 mm. with juvenile characters, i. e. body deepest at some distance behind head, head small, teeth feeble, and paired fins short. The barbel is about as long as the head, ending in an elongate bulb. The pectoral fin has 3 well-developed and 2 minute rays; we have found additional minute pectoral rays in young *E. monodactylus*, so that their presence does not detract from the probability that *E. microcephalus* is a young *E. longibarba*.

19. EUSTOMIAS SIMPLEX, sp. n.

Depth of body 10 in the length, length of head 7 to 7½. Diameter of eye 6 in length of head, equal to interorbital width. Barbel about ½ length of fish, ending in a simple oblong bulb; stem un-

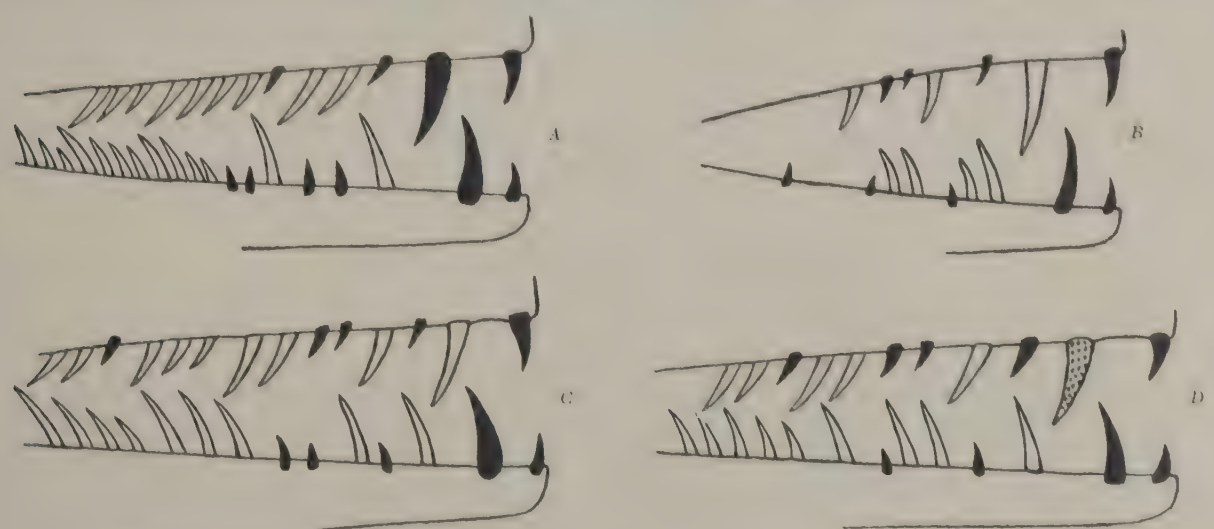


Fig. 67. Diagrams of dentition of *A. Eustomias patulus*; *B. E. simplex*; *C. E. longibarba*; *D. E. dubius*.

pigmented, or with scattered black dots that become more numerous just below bulb. Dorsal 23—26. Anal 34—36. Pectoral 3. Pelvics behind middle of length. Ventral photophores I.-P. 7; P.-V. 29—30; V.-A. 12—14; A.-C. 16—18; lateral, O.-V. 29—30; V.-A. 12—14.

Atlantic.

Three specimens.

St. 1043, M.W. 150. Length to base of caudal 71 mm.; barbel 32 mm.; bulb 1½ mm.

St. 1072, M.W. 80. Length to base of caudal 50 mm.; barbel incomplete.

St. 1352, M.W. 300. Length to base of caudal 75 mm.; barbel 40 mm.; bulb 1⅜ mm.

The specimens from Stations 1043 and 1072 are faded and show a series of 7 blackish spots along the back beneath the skin, exactly corresponding to those of *Stylophthalmus macrenteron* (Regan, "Terra Nova" Larval and Postlarval Fishes, p. 137, pl. V, fig. 1, 1916).

20. EUSTOMIAS DUBIUS, Parr, 1927.

Bull. Bingham Ocean. Coll. III, (2), p. 66, figs. 36 D, 38.

Depth of body 11 to 15 in length, length of head $7^1/_2$ to 8. Diameter of eye 5 to 6 in length of head, interorbital width $7^1/_2$ to 8. Barbel $^2/_7$ to nearly $^1/_3$ length of fish; axis pigmented, tapering; bulb

Fig. 68. *Eustomias dubius;* end of barbel.

divided by a deep distal notch into two lobes, the shorter rounded, the longer tapering and bearing two minute terminal filaments. Dorsal 24. Anal 38—39. Pectoral 2. Ventral photophores I.-P. 7—8; P.-V. 34—35; V.-A. 13—16; A.-C. 18; lateral O.-V. 33—35; V.-A. 15—17.

Western Atlantic; Caribbean Sea.

Two specimens, each 122 mm. in length to base of caudal, from Stations 1273 and 1292, with 900 and 600 metres of wire out. A third, 72 mm., from Station 1185, (M.W. 1500) has the paired fins rather short and the barbel only $^1/_5$ the length, nearly white, and with the longer lobe of the bulb relatively short.

We refer these specimens to *E. dubius* on the assumptions (1) that in the type the longer lobe of the bulb has been damaged and that the fan-shaped appendage it bears is the result of regeneration, and (2) that the figure, which shows a barbel about $^1/_3$ the length of the fish, is correct, and not the description, which says that the barbel (50 mm.) is more than $^3/_5$ the length of the fish (84 mm.).

21. EUSTOMIAS POLYASTER, Parr, 1927.

Bull. Bingham Ocean. Coll. III, (2), p. 74, figs. 7, 42.

Depth of body 11 to 13 in the length, length of head 7 to $8^2/_3$. Diameter of eye $4^2/_3$ to 6 in length of head, interorbital width 8, snout $2^2/_5$ (protracted) to $3^1/_2$ (retracted). Barbel $^1/_2$ to nearly $^2/_3$ length of fish; axis white or lightly pigmented; a small rounded or oval proximal bulb, followed by a larger bulb divided by a distal notch into two unequal lobes, the longer tapering, and bearing a long branched terminal appendage, the stem of which contains several oblong or oval bodies. Dorsal 23—26. Anal 34—40. Pectoral 2. Photophores in ventral series I.-P. 7; P.-V. 34—36; V.-A. 16—17; A.-C. 17—18; lateral, O.-V. 33—35; V.-A. 17—18.

Western Atlantic; Caribbean Sea.

Six specimens, 62 to 132 mm. in length to base of caudal, from Stations 1191, 1257, 1260, 1269 and 1293, with 300 to 1000 metres of wire out.

These show some variation in the structure of the barbel, the oblong or oval bodies of the stem of the appendage varying in size and number, and the distal slender part being unbranched in one, but bearing a few short branches in four, and numerous longer branches in one. All differ from Parr's type in having 2 or 3 long branches from the distal end of the bulb, or from the axis of the appendage just beyond it. Parr's type is said to have a number of short filaments in this position, but this appearance may be due to the branches being broken and matted round the stem.

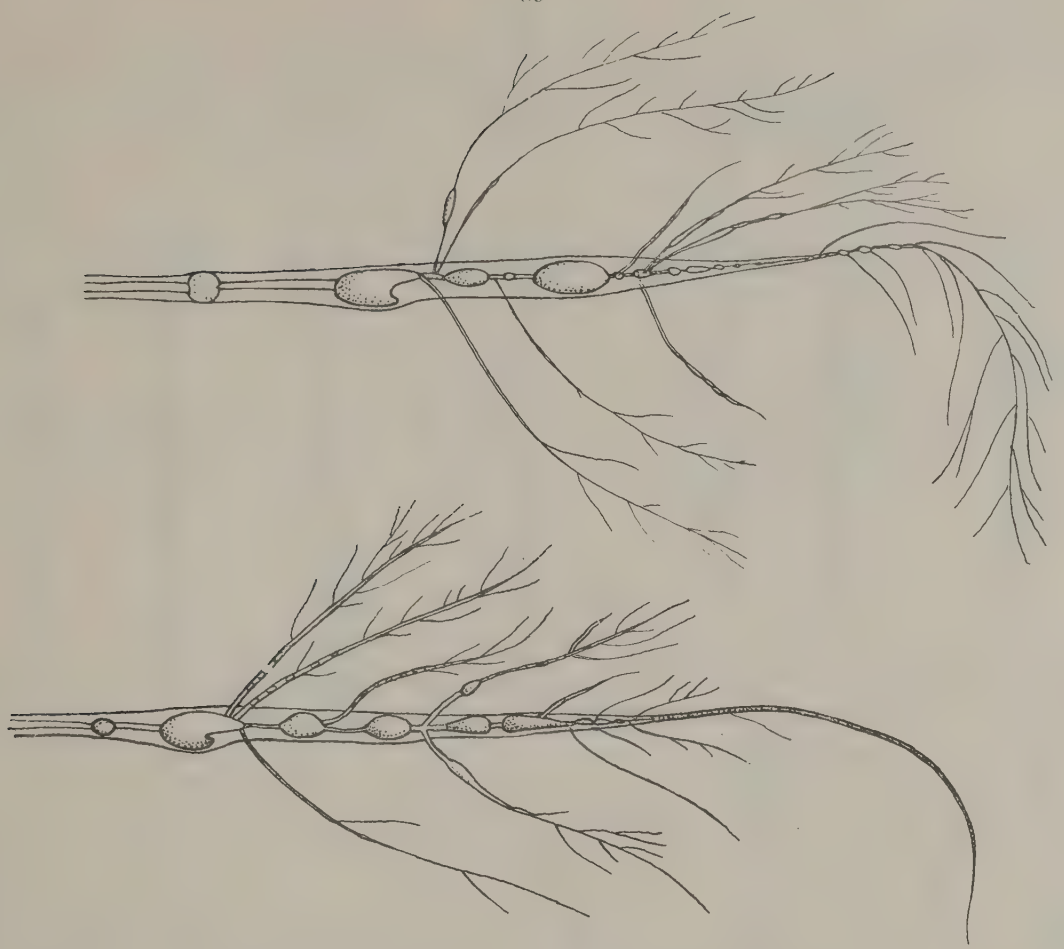


Fig. 69. *Eustomias polyaster*; end of barbel of two specimens.

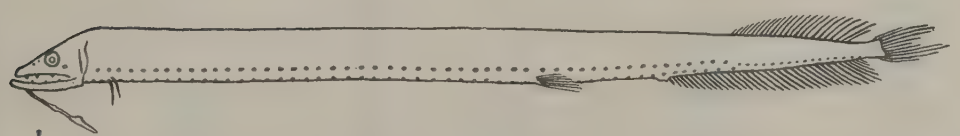


Fig. 70. *Eustomias polyaster*; young fish 65 mm. long.

Fig. 71. *Eustomias polyaster*. End of barbel of two young specimens.

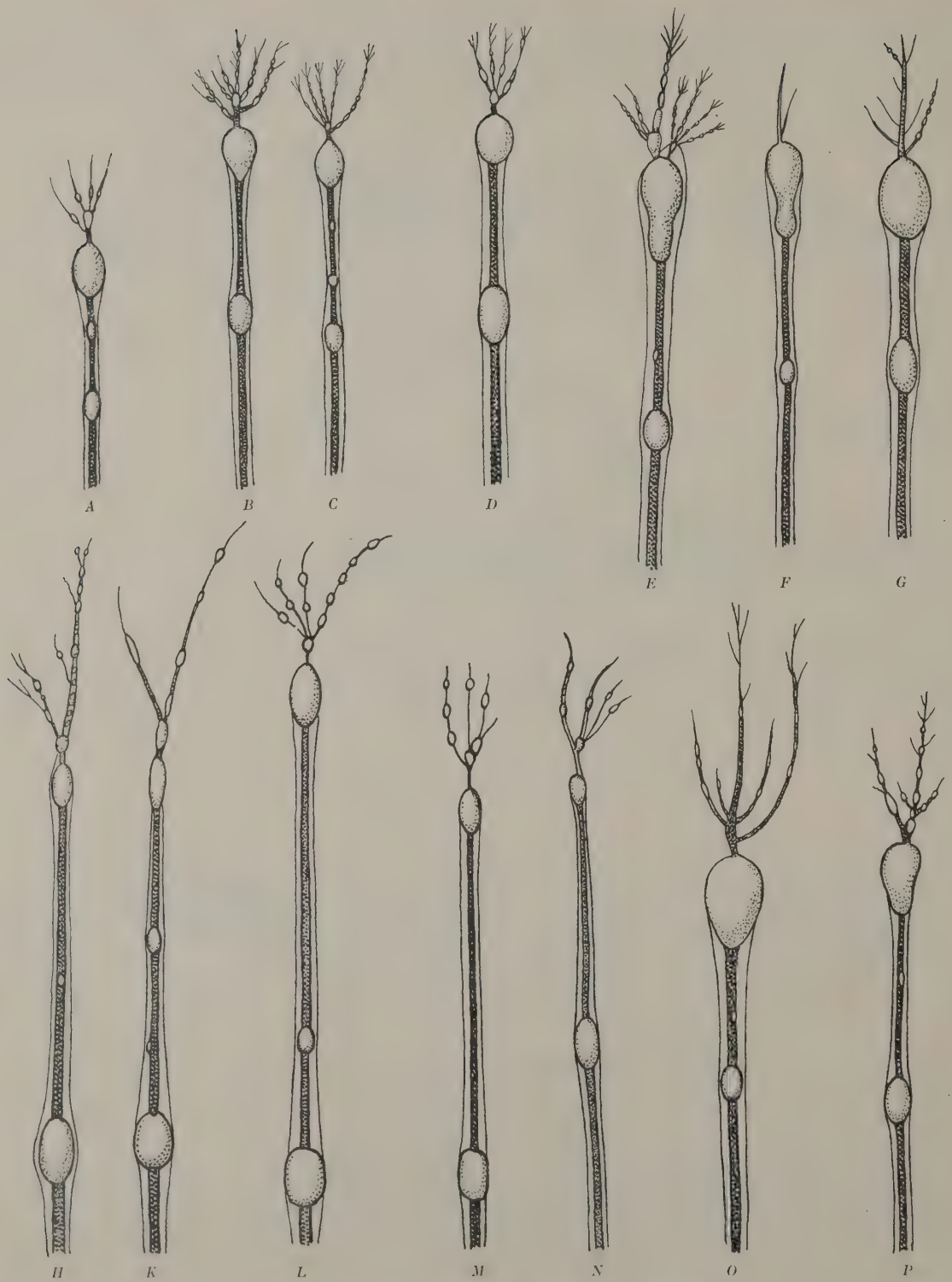


Fig. 72. *Eustomias variabilis*. End of barbel of 14 specimens.

A juvenile specimen from Station 1182 (M.W. 600) is 65 mm. long to base of caudal. Head small ($9^2/_3$ in length), paired fins short; barbel (fig. 71, B) 10 mm. Another of 65 mm. from Station 1194 (M.W. 600) is less advanced (fig. 70); head $10^1/_2$ in the length; barbel (fig. 71, A) shorter.

22. EUSTOMIAS VARIABILIS, sp. n.

Depth of body 10 to 13 in the length, length of head 7 to 9. Diameter of eye $4^1/_2$ to 6 in length of head, interorbital width $5^1/_2$ to $7^1/_2$. Barbel from about $^1/_5$ to $^2/_5$ length of fish; stem with pigmented axis; two well-separated bulbs, and sometimes one or two smaller ones between them; distal bulb either

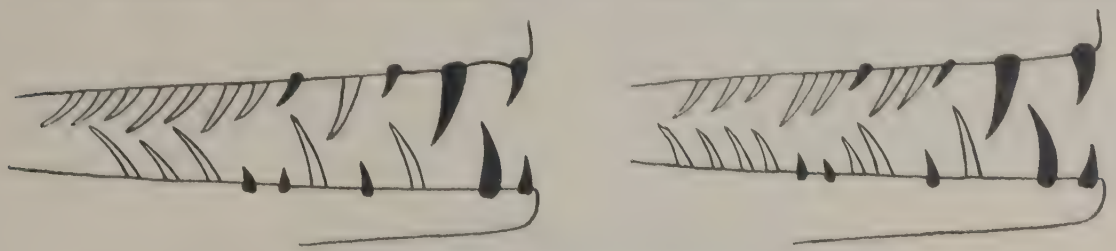


Fig. 73. Diagrams of dentition of *A. Eustomias variabilis*, and *B. E. trituberatus*.

elongate, ovate, or pearshaped, with one or two terminal appendages that are generally branched, the stem and the filamentous branches generally beaded. Dorsal 21—25. Anal 33—36. Pectoral 2. Pelvic 7. Ventral photophores I.-P. 7; P.-V. 32—33; V.-A. 15—17; A.-C. 16—18; lateral, O.-V. 32—34; V.-A. 16—17.

Western Atlantic; Caribbean Sea.

Seventeen specimens 56 to 145 mm. in length to base of caudal, from Stations 1180, 1183, 1188, 1189, 1216, 1257, 1269, 1272, 1284, 1289, 1291, 1293 and 1294, with 300 to 4000 metres of wire out.

The variation in structure of the barbel is shown in figure 72. The specimens may be arranged thus:

I. Distal bulb narrower than proximal.
   A. Terminal appendage with 2 main filaments. St. 1188, length 98 mm., barbel 41 mm. (fig. H); St. 1180, length 66 mm., barbel 14 mm.; St. 1183, length 145 mm., barbel 46 mm. (fig. K).
   B. Terminal appendage with 4 main filaments. St. 1189, length 79 mm., barbel 29 mm. (fig. N); St. 1216, length 114 mm., barbel 39 mm. St. 1284, length 145 mm., barbel 50 mm. (fig. L). St. 1294, length 90 mm., barbel 36 mm. (fig. M).

II. Distal bulb broader but shorter than proximal; 4 main filaments. St. 1293, length 60 mm., barbel 14 mm. (fig. D).

III. Distal bulb longer and broader than proximal; terminal appendage with 2, 4, or more main filaments.

St. 1293, length 63 mm., barbel 20 mm. (fig. P).

St. 1269, length 56 and 57 mm., barbels 12 mm. (figs. B, C).

St. 1289, length 68 mm., barbel 18 mm. (fig. A).

St. 1291, length 68 mm., barbel 20 mm. (fig. E); length 68 mm., barbel 14 mm. (fig. F); length 70 mm., barbel 18 mm. (fig. G).

St. 1272, length 73 mm., barbel 26 mm. (fig. O).

23. EUSTOMIAS TRITUBERATUS, sp. n.

Depth of body $10^1/_2$ to $12^1/_2$ in the length, length of head about 8. Diameter of eye 5 to $5^1/_2$ in length of head, interorbital width $5^1/_2$ to 6. Barbel about $^1/_5$ length of fish; axis pigmented; three bulbs,

the middle one very near to the distal one, which is larger than the others, ovate, and bears a minute distal filament that may have 2 or 3 branches. Dorsal 23—24. Anal 36. Pectoral 2. Ventral photophores I.-P. 7—8; P.-V. 32; V.-A. 14—16; A.-C. 17—18; lateral, O.-V. 31—34; V.-A. 16—17.

Caribbean Sea.

Three specimens, 70 to 75 mm. in length to base of caudal, from Stations 1279, 1281 and 1291, with 100 to 300 metres of wire out.

24. EUSTOMIAS BREVIBARBATUS, Parr, 1927.

Bull Bingham Ocean. Coll. III (2), p. 68, figs. 36 A, 40.

Depth of body 10 to $12^1/_2$ in the length, length of head 7 to $8^2/_3$. Diameter of eye $5^1/_3$ to $6^2/_3$ in length of head, interorbital width 6 to 7. Barbel from less than $^1/_4$ to $^1/_3$ length of fish; two rounded or oval bulbs, rarely separated by a distance greater than the length of the distal bulb, which is much the larger, and bears a small terminal appendage consisting of 2 to 4 filaments on a short stalk; axis of stem

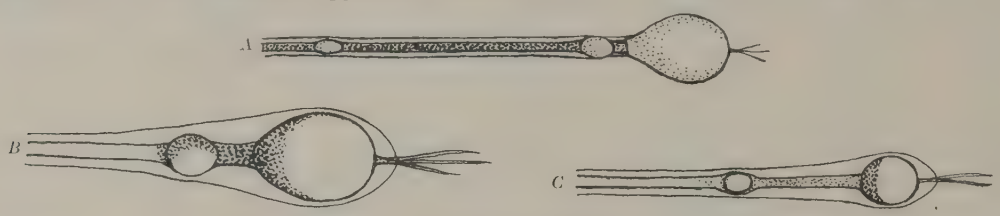


Fig. 74. End of barbel of *A. Eustomias trituberatus*; *B, C. E. brevibarbatus.*

pigmented between bulbs; proximal part of distal bulb blackish; filaments white, but their stalk sometimes pigmented. Dorsal 23—26. Anal 34—38. Pectoral 2. Ventral photophores I.-P. 7—8; P.-V. 32—34; V.-A. 15—16; A.-C. 15—18; lateral, O.-V. 32—35; V.-A. 14—18.

Western Atlantic; Caribbean Sea.

Sixteen specimens, 57 to 148 mm. in length to base of caudal, from Stations 1174, 1178, 1183, 1184, 1188, 1189, 1194, 1196, 1229, 1269, 1273 and 1282, with 50 to 4000 metres of wire out.

We refer these with some hesitation to Parr's species. In the two smallest specimens, 57 and 68 mm. in length to base of caudal, the barbels measure 13 and 16 mm. respectively, whereas in the types, 57 and 63 mm. in length, the barbels measure respectively 8.5 and 10 mm. Moreover there is no mention in Parr's description of any pigment on or between the bulbs, but the filaments are said to be pigmented. However we have seen in other species specimens showing juvenile characters, such as a shorter and unpigmented barbel, although they were as large as or even larger than others more adult.

25. EUSTOMIAS XENOBOLUS, sp. n.

Depth of body 14 in the length, length of head 8. Diameter of eye 6 in length of head, interorbital width $8^1/_2$. Barbel $^2/_9$ length of fish; axis pigmented; bulb divided, the proximal part slender, the

Fig. 75. End of barbel of *Eustomias xenobolus.*

distal much broader, rounded, bearing 3 minute filaments on a short stalk. Dorsal 22. Anal 36. Pectoral 2. Lateral photophores V.-A. 15—16; others cannot be counted.

Caribbean Sea.

A single specimen, 170 mm. in length to base of caudal, from Station 1279, with 1000 metres of wire out.

26. EUSTOMIAS PYRIFER, sp. n.

Depth of body 11 in the length, length of head 8. Diameter of eye $4^2/_3$ in length of head, interorbital width $5^2/_3$, snout (retracted) $3^1/_3$. Barbel $^1/_4$ length of fish; axis white, with minute black dots;

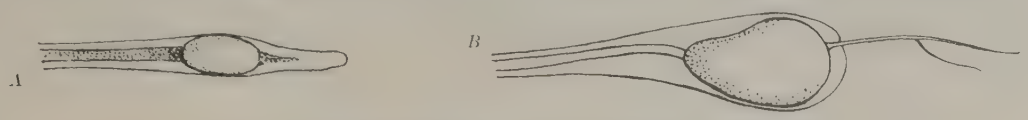


Fig. 76. End of barbel of *A. Eustomias globulifer*: *B. E. pyrifer.*

bulb pear-shaped, broader distally, bearing a single filament a little longer than itself, with one branch. Dorsal 24. Anal 35. Pectoral 2. Ventral photophores I.-P. 7; P.-V. 33; V.-A. 15; A.-C. 17; lateral O.-V. 34; V.-A. 17.

Caribbean Sea.

A single specimen, 135 mm. in length to base of caudal, from Station 1186, with 100 metres of wire out.

27. EUSTOMIAS GLOBULIFER, sp. n.

Depth of body 14 in the length, length of head $8^3/_4$. Diameter of eye 6 in length of head, interorbital width 6, snout $2^1/_3$. Barbel $^1/_6$ length of fish; axis pigmented, densely just below the small oval bulb, which bears an appendage as long as itself, translucent with dark axis. Dorsal 23. Anal 33. Pectoral 2. Ventral photophores I.-P. 7; P.-V. 31; V.-A. 16; A.-C. 17; lateral O.-V. 33; V.-A. 16.

Caribbean Sea.

A single specimen, probably young, 70 mm. in length to base of caudal, from Station 1285, with 600 metres of wire out.

28. EUSTOMIAS MACROPHTHALMUS, Parr, 1927.

Bull. Bingham Ocean Coll. III, (2), p. 67, figs. 36 C, 39.

? Eustomias micropterygius Parr, t. c. p. 65, fig. 37.

Depth of body $11^1/_2$ in the length, length of head $7^1/_2$. Diameter of eye $4^1/_2$ in length of head, interorbital width $6^1/_4$. Barbel nearly as long as fish; stem white; bulb elongate, with a minute terminal

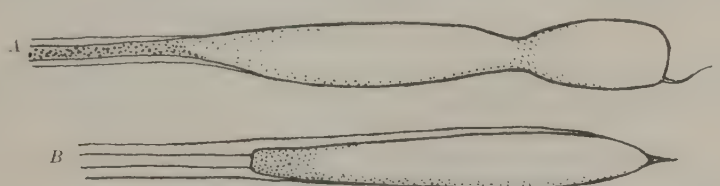


Fig. 77. End of barbel of *A. Eustomias leptobolus*; *B. E. macrophthalmus.*

filament. Dorsal 25. Anal 37. Pectoral 2. Ventral photophores, I.-P. 7; P.-V. 31; V.-A. 17; A.-C. 18; lateral O.-V. 32; V.-A. 17.

Western Atlantic; Caribbean Sea.

A single specimen from Station 1294, with 300 metres of wire out. Length to base of caudal 100 mm.; barbel 94 mm.; bulb 6 mm. Length of Parr's type 104 mm.; barbel 99 mm.; bulb 7 mm.

The type of *E. micropterygius* is 57 mm. long. It has the body deepest in the middle of the length, small head, feeble teeth, short paired fins, and barbel about as long as head, with small elongate bulb ending in a papilla. It is a young example of either *E. macrophthalmus* or an allied species.

29. EUSTOMIAS LEPTOBOLUS, sp. n.

Depth of body 12 in the length, length of head $8^2/_3$. Diameter of eye $4^2/_3$ in length of head, interorbital width $7^1/_3$. Barbel $^1/_2$ length of fish; stem apparenty white, but axis with minute black dots; bulb elongate, divided by a constriction into a narrower proximal and a shorter and broader distal part; a small terminal filament (fig. 77, A). Dorsal 23. Anal 38. Pectoral 2. Ventral photophores I.-P. 7; P.-V. 33; V.-A. 16; A.-C. 17; lateral, O.-V. 33; V.-A. 16.

Between Florida and Cuba.

A single specimen from Station 1230, with 800 metres of wire out. Length to base of caudal 95 mm; barbel 50 mm; bulb, 4 mm.

Sub-genus RHYNCHOSTOMIAS.

Barbel unbranched. Pectoral of 4 or 5 rays. Pelvics 7-rayed, behind middle of length. Teeth depressible, except a few small outer teeth in each jaw (fig. 79, A).

30. EUSTOMIAS PARRI, sp. n. (Pl. VIII, fig. 3).

Depth of body 11 in length, length of head 7. Diameter of eye $6^3/_4$ in length of head, interorbital width 6. Barbel $^1/_4$ length of fish; stem pigmented to within a short distance of the ovate bulb, which

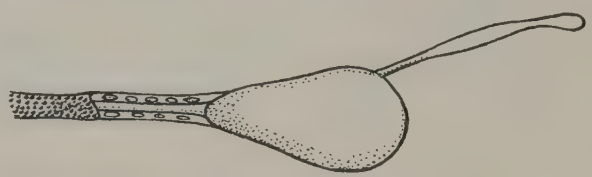


Fig. 78. *Eustomias parri*; end of barbel.

bears a somewhat swollen filament. Dorsal 24. Anal 42. Pectoral 4—5; rays slender, longer than head, unpigmented. Ventral photophores I.-P. 7; P.-V. 29; V.-A. 12; A.-C. 20; lateral, O.-V. 28; V.-A. 12.

Atlantic.

A single specimen from Station 1363, with 1000 metres of wire out. Length to base of caudal, 99 mm.; barbel, 26 mm.; unpigmented stem, 1 mm.; bulb, $1^3/_4$ mm.; filament, $1^3/_4$ mm.

Named in honour of Mr. Albert Parr, in recognition of his work on the Bingham Collection.

Sub-genus ACHIROSTOMIAS.

Barbel unbranched. Pectoral fins absent. Pelvics 7-rayed, behind middle of length. Teeth rather few, depressible, except a few small outer teeth in each jaw (as in *Neostomias*, fig. 99).

31. EUSTOMIAS DACTYLOBOLUS, sp. n. (Pl. VIII, fig. 4).

Depth of body about 12 in the length, length of head $7^1/_2$ to $8^1/_2$. Diameter of eye 6 in length of head, interorbital width $5^2/_3$. Barbel a little shorter than head; stem white, with a series of black dots

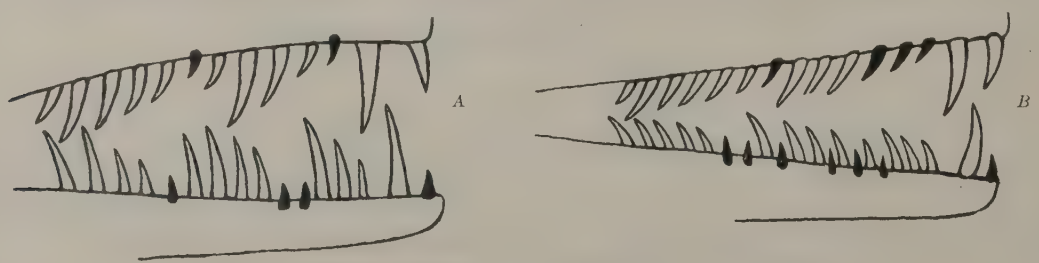


Fig. 79. Diagrams of dentition of *A. Eustomias parri; B. E. furcifer.*

along anterior edge, and proximally an anterior blackish streak on axis; bulb rather large, truncated, with anterior corner of distal edge produced as a blunt appendage. Dorsal 24. Anal 38—40. Pectoral 0. Ventral photophores I.-P. 7; P.-V. 28—29; V.-A. 13; A.-C. 19—20; lateral, O.-V. 29; V.-A. 14.

Atlantic.

Two specimens, 85 and 86 mm. in length to base of caudal, from Stations 1160 and 1165, with 300 metres of wire out.

32. EUSTOMIAS LIPOCHIRUS, sp. n.

Depth of body 12 in the length, length of head 8. Diameter of eye 5 in the length of head, interorbital width $5^1/_2$. Barbel a little shorter than head: axis pigmented to within a short distance of bulb;

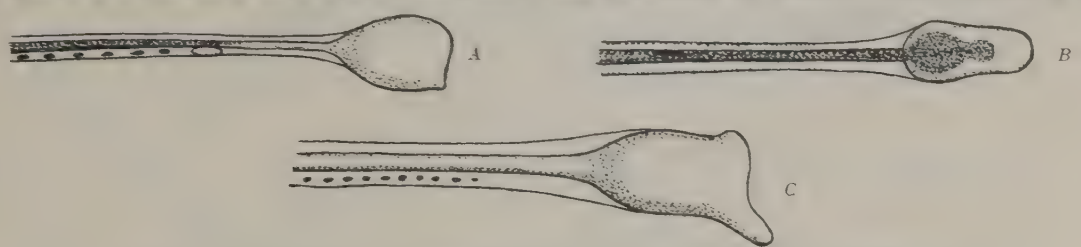


Fig. 80. End of barbel of *A. Eustomias lipochirus; B. E. melanobolus; C. E. dactylobolus.*

an anterior series of black dots; bulb rather small, ovate, distally with an anterior corner. Dorsal 24. Anal 40. Pectoral 0. Ventral photophores I.-V. 35; V.-A. 12; A.-C. 20; lateral, O.-V. 28: V.-A. 13.

Caribbean Sea.

A single specimen, 88 mm. in length to base of caudal, from Station 1273, with 800 metres of wire out. The barbel is of the same length, 9 mm., as in the 88 mm. specimen of *E. dactylobolus*, but the bulb, 1 mm., is only half as long.

33. EUSTOMIAS MELANOBOLUS, sp. n.

Depth of body 12 in the length, length of head 8. Diameter of eye $5^1/_2$ in length of head, interorbital width $5^1/_4$. Barbel $^4/_5$ length of head; axis black; sheath of stem translucent posteriorly, pigmented anteriorly to within a short distance of the oblong bulb, which encloses a central black body that shows through the semi-opaque white tissue of the bulb. Dorsal 25. Anal 42. Pectoral 0. Photophores indistinct; approximate numbers I.-V. 33; O.-V. 29; V.-A. 14; A.-C. 22.

Atlantic.

A single specimen, 60 mm. in length to base of caudal, from Station 1157, with 300 metres of wire out.

Sub-genus TRICLONOSTOMIAS.

Barbel with a posterior branch originating between a pair. Anterior fangs depressible; behind them several depressible and a few small fixed teeth (figs. 79, B; 82, A). Interorbital width 6 to $6^1/_2$ in length of head. Pectoral of 6 or 7 rays; pelvics 8-rayed, inserted a little behind middle of length. D. 24—25. A. 41—45.

34. EUSTOMIAS DRECHSELI, sp. n.

Depth of body 12 in the length, length of head 8. Diameter of eye $6^1/_2$ in length of head, interorbital width $6^1/_2$. Barbel, to end of bulb, $^1/_3$ length of fish; stem black to just before origin of branches; beyond this swollen and white, with a short translucent terminal appendage ending in a small rounded body. Branches originating at $^5/_6$ length of barbel, all three similar, long, slender, pigmented except near

their bases, with short filaments, and longer ones bearing rounded or oval bodies; the stem of each branch ends in a rounded or oval body from which 2 or 3 filaments arise, each of these similarly ending

Fig. 81. *Eustomias drechseli*; distal part of barbel.

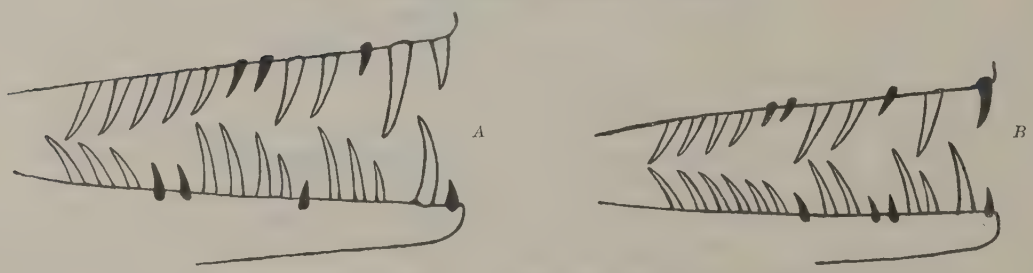


Fig. 82. Diagrams of dentition of *A. Eustomias drechseli*; *B. E. silvescens.*

in a minute body with 2 to 4 fine terminal filaments. Dorsal 25. Anal 42. Pectoral 6—7; rays filiform, twice as long as head. Pelvic 8. Ventral photophores I.-P. 7; P.-V. 29; V.-A. 13; A.-C. 22; lateral O.-V. 29; V.-A. 13.

Atlantic.

A single specimen from Station 1367, with 1000 metres of wire out. Length to base of caudal 108 mm.; barbel to origin of branches 30 mm.; to end of appendage of bulb 36 mm.

Named in honour of Commodore C. F. Drechsel, President of the Dana Committee.

35. EUSTOMIAS FURCIFER, sp. n.

Depth of body $11^1/_2$ in the length, length of head $7^2/_3$. Diameter of eye 7 in length of head, interorbital width $6^1/_4$. Barbel a little more than $^1/_4$ length of fish; stem pigmented to a little beyond

Fig. 83. *Eustomias furcifer*; distal part of barbel.

origin of branches; beyond this somewhat swollen and white, except for a posterior black streak which may be on the axis; bulb oval, without appendages; branches originating at $^4/_5$ length of barbel; lateral

branches simple unpigmented filaments, median branch extending beyond end of bulb, unpigmented, forked distally, each limb of the fork bearing several filaments. Dorsal 24. Anal 45. Pectoral 6. Pelvic 8. Ventral photophores I.-P. 7; P.-V. 28; V.-A. 13; A.-C. 23; lateral, O.-V. 28; V.-A. 14.

Atlantic.

A single specimen from Station 1372, with 3000 metres of wire out.

Length to base of caudal 138 mm., barbel to origin of branches 28 mm.; to distal end of bulb 36 mm.; bulb 2 mm.

36. EUSTOMIAS TENISONI, sp. n. (Pl. IX, fig. 1).

Depth of head 11, of body 19 in the length; length of head 7. Diameter of eye 7 in length of head, interorbital width 6. Barbel a little more than $^1/_3$ length of fish; stem pigmented; bulb ovate, with a filament at its base and four at the end, the longest slender and branched, the next simple, the others

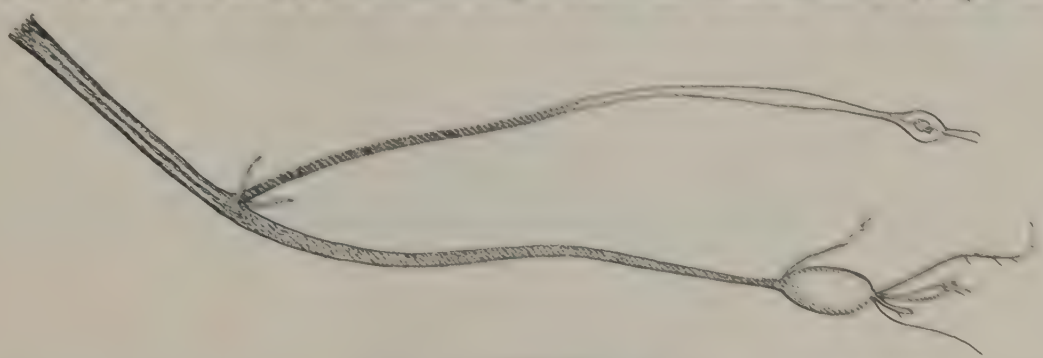


Fig. 84. *Eustomias tenisoni*; barbel.

swollen; branches originating at $^1/_3$ length of stem; paired branches short, simple, unpigmented filaments, median branch as long as the barbel beyond its origin, at first pigmented, then translucent and somewhat expanded, ending in a translucent ovate bulb containing one small and two very small rounded opaque bodies, and bearing a simple translucent appendage as long as itself. Dorsal 25. Anal 41. Pectoral 7; rays long, slender, $1^1/_2$ length of head. Pelvic 8. Ventral photophores I.-P. 7; P.-V. 30; V.-A. 13; A.-C. 21; lateral, O.-V. 31; V.-A. 14.

Atlantic.

A single specimen from Station 1330, with 500 metres of wire out.

Length to base of caudal 87 mm.; barbel to origin of branches 10 mm.; to distal end of bulb 31 mm.; bulb 3 mm.

Named in honour of Lieutenant-Colonel W. P. C. Tenison, D. S. O., whose accurate and artistic drawings are reproduced as the plates of this report.

Sub-genus DINEMATOCHIRUS

Barbel typically with 3 posterior branches, the median originating from between the lateral pair, but sometimes with one branch only. First tooth in upper jaw usually fixed, and, except in *E. silvescens*, second in lower; behind them a series of depressible teeth and a few small outer fixed teeth (figs. 82, B; 95). Interorbital width 4 to $5^1/_2$ in length of head, equal to or greater than diameter of eye. Pectoral of 2 rays, sometimes with a minute third ray. Pelvics 7-rayed, equidistant from head and base of caudal, or nearer head, not nearly reaching anal. Dorsal 22—26. Anal 36—46.

Typically the 3 branches arise together from the stem of the barbel. In *E. frondosus* the median branch is reduced to a filament and the lateral branches may unite at the base; this species leads to *E. binghami*, in which the median branch is absent and the lateral pair unite for some distance to form

a single stem. In *E. fissibarbis* the lateral branches originate from the median branch, and the barbel of *E. dendriticus* may also be thus interpreted. In *E. monoclonus* only the median branch is present, and there is no trace of the lateral branches.

37. EUSTOMIAS PARVIBULBUS, Parr, 1927.

Eustomias bigelowi parvibulbus, Parr, Bull. Bingham Ocean. Coll. III (2), p. 79, figs. 44, 46.

Depth of body 10 in the length, length of head 7. Diameter of eye nearly 6 in length of head. Barbel as long as head; stem black; bulb small, with 3 median filaments, the longest with several small branches; median branch from stem of barbel slender, pigmented, ending in a very small bulb bearing a tassel of minute filaments; lateral branches twice as long, $1^2/_5$ length of main stem of barbel, very slender, tapering to fine filaments. Fins and photophores as in *E. bigelowi*.

Western Atlantic.

Length to base of caudal 204 mm.; head 29 mm.; barbel to end of bulb 30 mm.; lateral branches 42 mm.

This species is evidently very closely related to *E. bigelowi*, apparently differing only in the smaller bulb and longer lateral branches of the barbel. According to Parr the bulb is narrower than the stem proximal to it, and it is probable that the so-called bulb is the unpigmented terminal part of a bulb similar to that of *E. bigelowi*, but smaller and narrower; possibly the structure may be better shown in the figure of the type (fig. 44) than in the separate drawing of the barbel (fig. 46).

38. EUSTOMIAS BIGELOWI, Welsh, 1923.

Proc. U. S. Nat. Mus. LXII, (3), p. 6, figs. 5, 6.

Depth of body 10 to 12 in the length, length of head $8^1/_2$ to $8^2/_3$. Diameter of eye $4^1/_2$ to 5 in length of head, a little less than interorbital width. Barbel about as long as head, with large ovate ter-

Fig. 85. *Eustomias bigelowi*; barbel.

minal bulb bearing 3 median longer and 2 or 3 pairs of shorter distal filaments; branches slender, about $^1/_2$ to $^3/_4$ length of barbel; median with small terminal bulb bearing some small filaments with swollen

ends; lateral tapering, with or without swellings, and with a few filamentous branches that may have swollen ends; stem of barbel and proximal half of bulb black; branches pigmented towards the base. Dorsal (22)—25. Anal 41—42. Pectoral 2. Pelvic 7. Ventral photophores I.-P. 7; P.-V. 28—29; V.-A. 14—16; A.-C. 21—22; lateral, O.-V. 28—29; V.-A. 16—17.

Western Atlantic.

Two specimens, 56 and 95 mm. in length to base of caudal, from Stations 1231 and 1358, with 600 and 2000 metres of wire out. The smaller agrees closely with the type in the shape of the bulb of the barbel, and in the furrows on its distal part.

39. EUSTOMIAS TRIRAMIS, sp. n.

Depth of body 12 in the length, length of head 8. Diameter of eye $5^1/_2$ in length of head, interorbital width $4^1/_2$. Barbel scarcely longer than head; stem pigmented to origin of branches, thence pigmented posteriorly and with pigmented axis; pigment extending on to posterior part of the large subovate

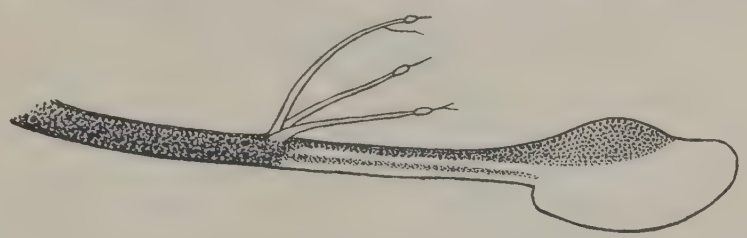


Fig. 86. *Eustomias triramis*; barbel.

bulb; branches short, slender, simple, unpigmented, each ending in a minute bulb with terminal filament. Dorsal 25. Anal 41. Pectoral 2. Pelvic 7. Ventral photophores I.-P. 7; P.-V. 27; V.-A. 16; A.-C. 21; lateral, O.-V. 27; V.-A. 17.

Atlantic.

A single specimen from Station 1063, with 110 metres of wire out. Length to base of caudal 73 mm.; head 9 mm.; barbel 10 mm.

40. EUSTOMIAS PAUCIFILIS, Parr, 1927.

Eustomias bigelowi paucifilis, Parr, Bull. Bingham Ocean. Coll. III, (2), p. 79, fig. 45.

Depth of body 11 to 12 in the length, length of head $7^1/_4$ to $7^1/_2$. Diameter of eye 6 to 7 in length of head, interorbital width $4^1/_2$. Barbel nearly as long as head; stem pigmented to origin of branches, translucent with pigmented axis beyond; bulb sub-spherical, with a pair of pigment patches, and bearing

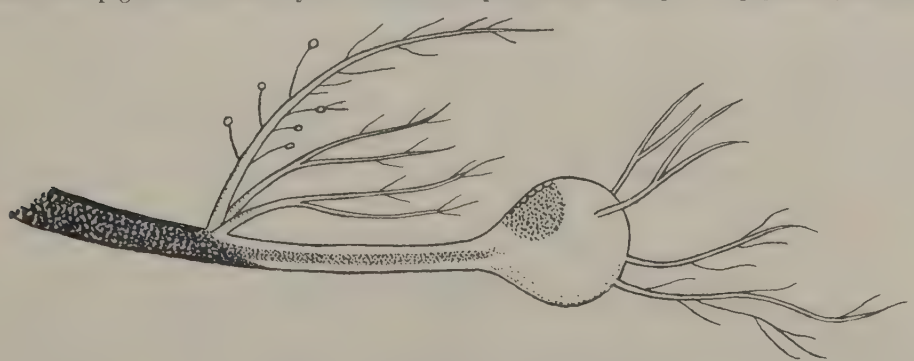


Fig. 87. *Eustomias paucifilis*; barbel.

2 median filaments, one or both branched, and a pair of forked filaments. Branches slender, unpigmented; median longest, tapering, bearing several small filaments; lateral branches shorter, not or barely reaching bulb, forked, sometimes with filaments. Dorsal 23—26. Anal 39—42. Pectoral 2. Pelvic 7. Ventral photophores I.-P. 7; P.-V. 28; V.-A. 13—14; A.-C. 20—21; lateral, O.-V. 26—28; V.-A. 14—15.

Atlantic.

Three specimens, 68 to 70 mm. in length to base of caudal, from Stations 1072 and 1165, with 300 and 2000 metres of wire out.

41. EUSTOMIAS SILVESCENS, sp. n. (Pl. IX. fig. 2).

Depth of body 12 in the length, length of head 8. Diameter of eye $4^2/_3$ in length of head, equal to interorbital width. Barbel, to end of bulb, a little shorter than head; stem pigmented to origin of branches, thence with pigmented axis; bulb broad, with terminal filament; median branch twice as long

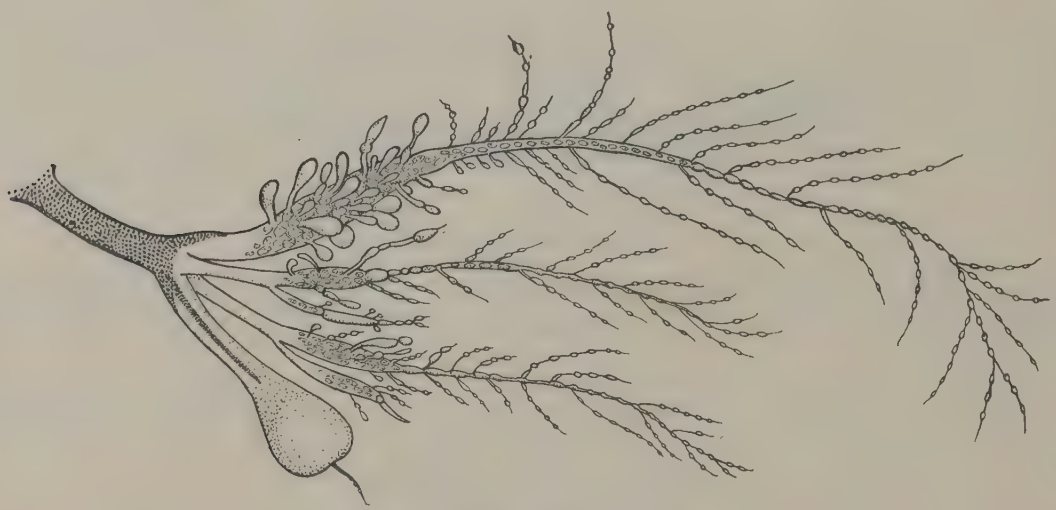


Fig. 88. *Eustomias silvescens*; barbel.

as head, unpigmented, proximally swollen, containing a number of ovate bodies, and bearing a number of oval bulbs on short stalks; distally tapering, beaded, and bearing several filamentous branches, also beaded; each lateral branch gives off a small secondary branch, but is otherwise similar to the median branch, although not so long. Dorsal 25. Anal 42. Pectoral 2. Pelvic 7. Ventral photophores I.-P. 7; P.-V. 27; V.-A. 14; lateral, O.-V. 27; V.-A. 15.

Caribbean Sea.

A single specimen from Station 1266, with 800 metres of wire out.

Length to base of caudal 111 mm.; head 14 mm.; barbel to origin of branches 4 mm.; to end of bulb 11 mm.; median branch 26 mm.

42. EUSTOMIAS SCHMIDTI, sp. n. (Pl. IX, fig. 3).

Depth of body 10 in the length, length of head 7. Diameter of eye $5^1/_2$ to $5^3/_4$ in length of head, interorbital width $4^1/_2$. Barbel as long as head; stem pigmented; bulb large, white, divided by a con-

striction into a longer oval proximal part and a shorter rounded distal part; a small filament from base of distal part of bulb; median branch with short black stem bearing an elongate bulb with a pair of

Fig. 89. *Eustomias schmidti*; barbel of two 70 mm. specimens. *A*. young, (× 24) and *B*. adult (×11).

small filaments at the end; lateral branches unpigmented, about 1/2 length of barbel, each with one long and one or two short branches. Dorsal 22—26. Anal 40—44. Pectoral 2. Pelvic 7. Ventral photophores I.-P. 7—8; P.-V. 27—28; V.-A. 14—15; A.-C. 20—22; lateral, O.-V. 27—28; V.-A. 15.

Atlantic.

Two specimens, 70 and 55 mm. in length to base of caudal, from Stations 1019 and 1238, with 150 and 800 metres of wire out.

A third specimen, 70 mm. in length to base of caudal, from Station 1178, M.W. 300, is very

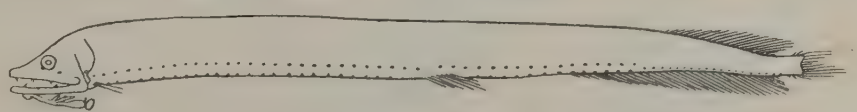


Fig. 90. *Eustomias schmidti*; young.

interesting, for in spite of its size it shows juvenile characters. Head small (11 in length), paired fins short, barbel (fig. 89, A) short (4 mm. as against 10 mm. in the other 70 mm. specimen), with short stout branches.

Named in honour of Dr. Johannes Schmidt, Leader of the Dana Expedition.

43. EUSTOMIAS MACRONEMA, sp. n.

Depth of body 13 1/2 in the length, length of head 9 1/2. Diameter of eye 7 in length of head, interorbital width 4 1/2. Barbel as long as head; stem pigmented, the pigment extending along the anterior edge of the large bulb, which is concave anteriorly, convex posteriorly, and bears a long and stout terminal filament; lateral branches each divided into a longer pigmented and smaller white branch, all four bearing

filaments, some with terminal swellings; median branch similar but incomplete. Dorsal 22. Anal 37. Pectoral 2. Pelvic 7. Ventral photophores, I.-P. 7; P.-V. 28; V.-A. 14; A.-C. 21; lateral O.-V. 29; V.-A. 14.

Atlantic.

A single specimen, 67 mm. in length to base of caudal, from Station 1152, with 600 metres of wire out.

Fig. 91. *Eustomias macronema*; barbel.

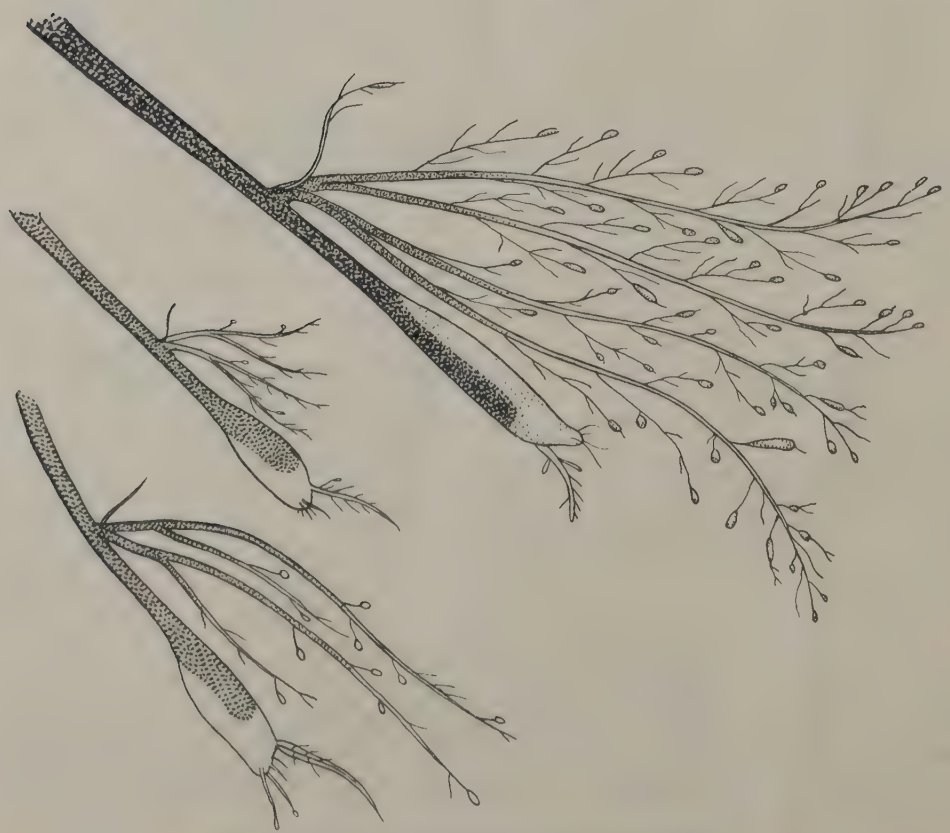


Fig. 92. *Eustomias frondosus*; barbel of three specimens.

44. EUSTOMIAS FRONDOSUS, sp. n.

Depth of body 8 to 12 in the length, length of head $6^{1}/_{2}$ to $8^{1}/_{2}$. Diameter of eye about 5 in length of head, equal to or a little less than interorbital width. Barbel as long as or a little longer than head; pigment of stem extending on to the posterior (? sometimes anterior) part of the large, ovate or elongate bulb, which bears a rather long branched terminal filament distal to the pigmented part; 1 or more smaller median filaments and 1 or 2 pairs of lateral filaments; median branch represented by a slender filament, sometimes bearing a minute bulb; lateral branches sometimes united at base, each divided into two tapering branches bearing several filaments, some with swellings; branches pigmented proximally in adult. Dorsal 23—25; Anal 39—45. Pectoral 2, sometimes with a minute third ray. Pelvic 7. Ventral photophores I.-P. 7; P.-V. 24—25; V.-A. 14—15; A.-C. 20—22; lateral, O.-V. 24—26; V.-A. 13—16.

Atlantic.

Six specimens, 52 to 100 mm. in length to base of caudal, from Stations 928, 945, 1239, 1242, and 1360, with 200 to 800 metres of wire out. Of five with barbel complete the pigment appears to extend on to the posterior part of the bulb in three and on to the anterior part in two; in the latter the bulb is probably reversed by twisting of the stem.

This species leads to *E. binghami*.

45. EUSTOMIAS BINGHAMI, Parr, 1927.

Bull. Bingham Ocean. Coll. III, (2), p. 80, figs. 47, 48.

Barbel $1^{1}/_{2}$ length of head; stem pigmented; pigment extending on to posterior part of the large elongate bulb, which bears 5 minute terminal filaments and a long branched filament; a single branch,

Fig. 93. *Eustomias binghami*; barbel (after Parr).

with short pigmented stem dividing into 4 equal slender branches, each of which ends in a small bulb and bears a lateral filament also ending in a bulb. Dorsal 25. Anal 46. Pectoral 2. Pelvic 7. Ventral photophores I.-P. 7; P.-V. 25; V.-A. 14; A.-C. 22; lateral, O.-V. 25; V.-A. 14.

Western Atlantic.

Length of type to base of caudal; 99 mm.

This species is evidently closely related to *E. frondosus*, differing in the absence of the median branch of the barbel, and union of the proximal parts of the lateral branches.

46. EUSTOMIAS FISSIBARBIS, Pappenheim, 1914.

Neostomias fissibarbis, Pappenheim, Deutsche Südpolar-Exp. XV, Zool. 7, p. 175, figs. 4, 5.
Eustomias nigrifilis, Parr, Bull. Bingham Ocean. Coll. III, (2), p. 81, figs. 8, 49.

Depth of body 10 to 12 in the length, length of head 6 to 8. Diameter of eye $5^{1}/_{2}$ to $6^{1}/_{2}$ in length of head, interorbital width 5 to $5^{1}/_{2}$. Barbel 1 to $1^{1}/_{3}$ length of head; stem and proximal half of bulb pig-

mented; bulb rather elongate, distally with 2 to 4 median and 1 to 3 pairs of filaments; median branch rather stout, ending in a small ovate bulb, which bears on a common stalk several filaments that end in swellings; stem of branch and proximal half of its bulb pigmented; lateral branches originating from

Fig. 94. *Eustomias fissibarbis*. Barbel of young (*A*) and of three adults.

median branch at some distance from main stem of barbel; each divides into two, and the limbs are pigmented except distally, may contain oblong or oval swellings, and may bear some short filaments. Dorsal 22—26. Anal 36—41. Pectoral 2. Pelvic 7. Ventral photophores I.-P. 7; P.-V. 27—28; V.-A. 13—15; A.-C. 19—21; lateral O.-V. 26—29; V.-A. 14—16.

Atlantic; Caribbean Sea.

Eight specimens, 57 to 100 mm. in length to base of caudal, from Stations 831, 837, 1194, 1198, 1223, 1228 and 1229, with 50 to 1200 metres of wire out.

In a specimen of 50 mm. from Station 1043 (M.W. 110) the paired fins are short, and the barbel is only $^3/_4$ the length of head, has the limbs of the lateral branches short and simple, and the filaments of the distal appendage of the median branch represented by buds (fig. 94, A).

47. EUSTOMIAS DENDRITICUS, sp. n.

Depth of body $11^2/_3$ in the length, length of head 8. Diameter of eye 6 in length of head, interorbital width $5^1/_3$. Barbel nearly as long as head; stem pigmented; bulb oblong, slightly constricted, pigmented proximal to constriction, bearing a pair of bifid filaments; only one branch, unpigmented, tape-

ring, branched; the first four secondary branches come off at the same level and may represent the two bifid lateral branches of *E. fissibarbis*. Dorsal 23. Anal 38. Pectoral 2. Pelvic 7. Ventral photophores I.-P. 7; P.-V. ca. 30; V.-A. 15; A.-C. 22; lateral, O.-V. ca. 30; V-.A. 16.

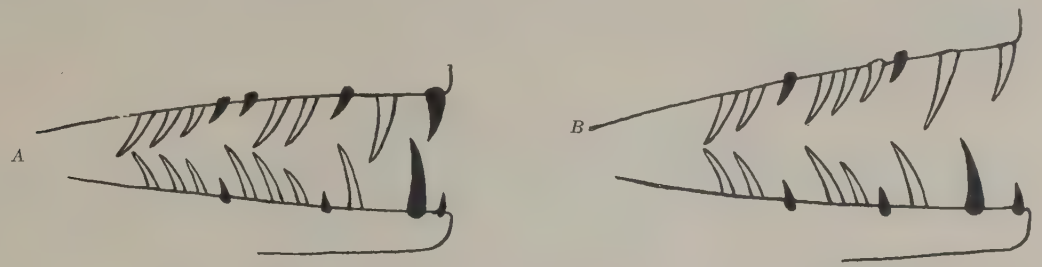


Fig. 95. Diagrams of dentition of *A. Eustomias fissibarbis*, and *B. E. monoclonus*.

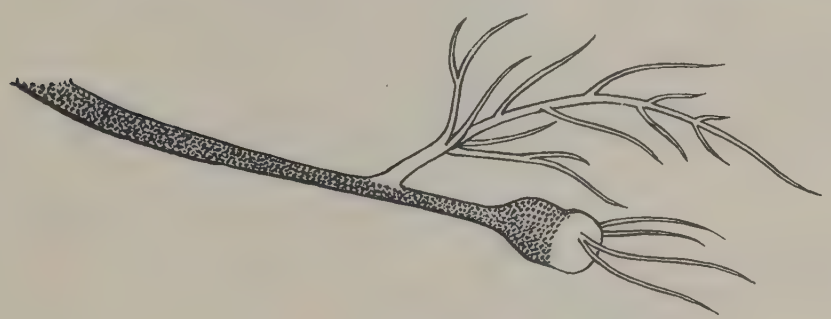


Fig. 96. *Eustomias dendriticus*; barbel.

Atlantic.

A single specimen from Station 1058, with 110 metres of wire out. Length to base of caudal 64 mm., head 8 mm.; barbel 7 mm. to end of bulb; branch, 5 mm.

48. EUSTOMIAS MONOCLONUS, sp. n.

Depth of body 11 in the length, length of head $8^1/_2$. Diameter of eye $6^3/_4$ in length of head, interorbital width $4^1/_2$. Barbel nearly as long as head; stem and proximal $^3/_4$ of bulb pigmented; distal part

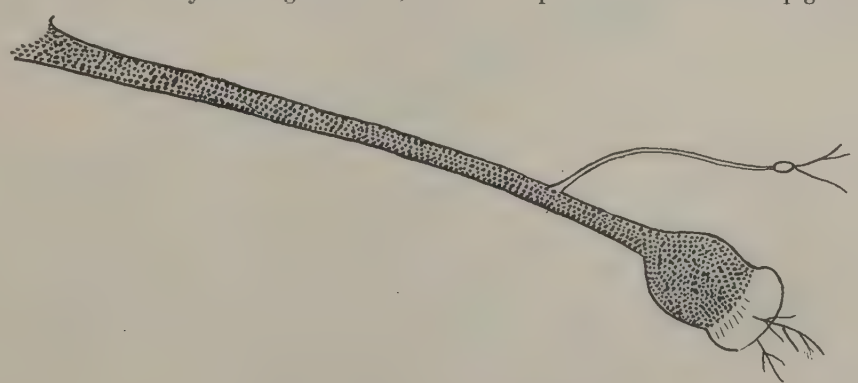


Fig. 97. *Eustomias monoclonus*; barbel.

of bulb separated from pigmented part by a constriction, and bearing a pair of minute branched filaments; a single small branch, slender, unpigmented, ending in a minute bulb with 2 terminal filaments. Dorsal 23.

Anal 40. Pectoral 2. Pelvic 7. Ventral photophores I.-P. 7; P.-V. 28; V.-A. 13—14; A.-C. 19; lateral, O.-V. 29; V.-A. 13.

Caribbean Sea.

A single specimen from Station 1186, with 2000 metres of wire out. Length to base of caudal 76 mm.; head 9 mm.; barbel 8 mm.

Sub-genus NEOSTOMIAS.

Barbel with 3 branches, the median originating from between the lateral pair. Teeth depressible, except a few small outer fixed teeth (fig. 99). Interorbital width 5 to 6 in length of head. Pectoral of a single ray, sometimes with a minute second ray. Pelvics 7-rayed, a little behind middle of length, not reaching anal. Dorsal 22—25. Anal 37—45.

49. EUSTOMIAS TETRANEMA, Zugmayer, 1913.

Bull. Inst. Océan., Monaco, No. 253, p. 2.

Depth of body 11 to 12 in the length, length of head 8 to $8^1/_2$. Diameter of eye $5^1/_2$ to 6 in length of head, equal to or less than interorbital width. Barbel $^2/_7$ to $^2/_5$ length of fish; stem with pigmented

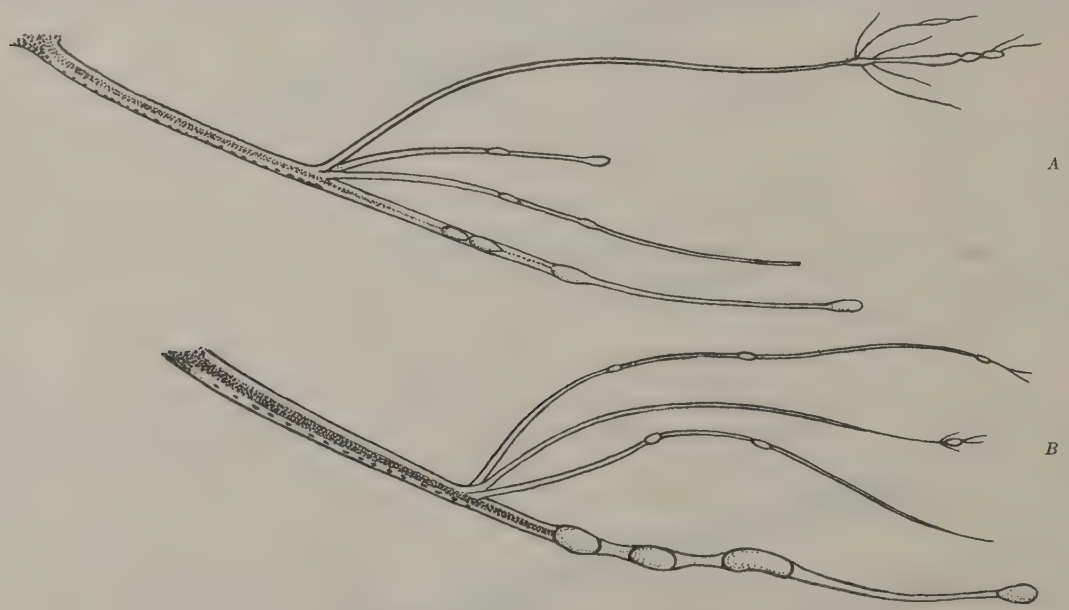


Fig. 98. *Eustomias tetranema*. *A*. barbel of type; *B*. barbel of a "Dana" specimen.

axis for $^1/_2$ the length and with an anterior series of black spots as far as the origin of the branches; distal half of stem unpigmented, with 3 or 4 oblong or oval bodies proximally and another at end; branches originating a little beyond $^1/_3$ of length, similar, slender, tapering, unpigmented, simple or bearing some minute threads distally; each branch with 1 to 4 small swellings. Dorsal 23—25. Anal 37—41. Pectoral 1. Pelvic 7. Ventral photophores I.-P. 7; P.-V. 28—30; V.-A. 13—14; A.-C. 20—21; lateral, O.-V. 28—29; V.-A. 14—15.

Atlantic.

Two specimens, 65 and 55 mm. in length to base of caudal, from Stations 1146 and 1148, with 400 and 500 metres of wire out.

Length of fish, 65 mm.; barbel, 20 mm.; to origin of branches, 7 mm.

The type, 110 mm. in length to base of caudal, has been examined and is included in the above description; it has the distal part of the stem of the barbel more slender and with smaller swellings than the "Dana" specimens.

50. EUSTOMIAS RAMULOSUS, sp. n.

Depth of body $10^1/_2$ in the length, length of head $7^2/_3$. Diameter of eye $6^1/_2$ in length of head, interorbital width $5^1/_2$. Barbel $^2/_5$ length of fish; axis pigmented throughout; an anterior series of black dots on proximal part; at a little more than $^1/_4$ of the length an elongate bulb; a small ovate terminal bulb bearing a filament; branches originating at less than $^1/_4$ the length, all unpigmented and relatively short, less than $^1/_3$ length of barbel; median branch slender, simple, with two small swellings; each lateral branch forked, and one limb again forked, and one of the forks again divided; divisions of the lateral branches with filaments, and most of them and of the filaments with series of swellings. Dorsal 25. Anal 43. Pectoral of a ray as long as head and a second very small ray in its axis. Pelvic 7. Ventral photophores I.-P. 7; P.-V. 27; V.-A. 15; A.-C. 21; lateral O.-V. 27; V.-A. 15.

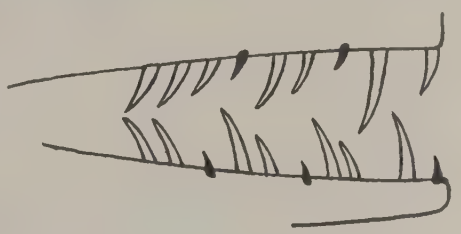


Fig. 99. *Eustomias ramulosus*; diagram of dentition.

Atlantic.

A specimen 84 mm. in length to base of caudal, from Station 1166, with 100 metres of wire out.

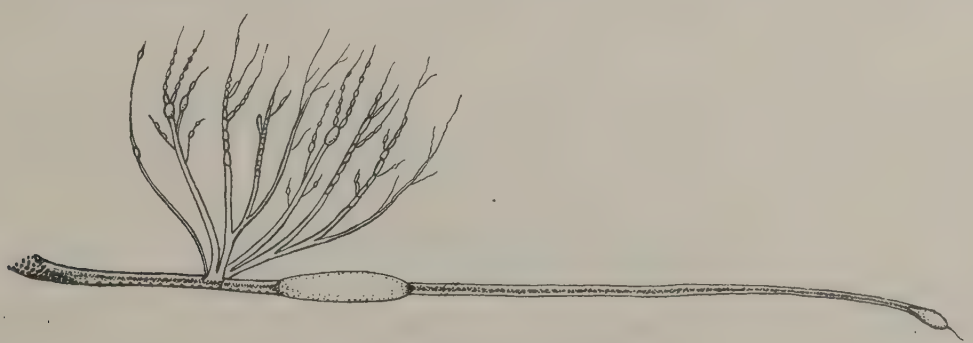


Fig. 100. *Eustomias ramulosus*; barbel.

51. EUSTOMIAS MONODACTYLUS, sp. n. (Pl. IX, fig. 4).

Depth of body 10 in length, length of head 7 to 9. Diameter of eye 6 to $6^1/_2$ in length of head, interorbital width 5 to 6. Barbel $^1/_5$ to $^1/_4$ length of fish; proximal part of stem with axis pigmented or not, and with an anterior series of black dots; at $^1/_2$ the length an elongate bulb, beyond which the stem

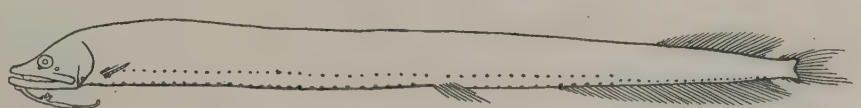


Fig. 101. *Eustomias monodactylus*; young.

is unpigmented and ends in a small swelling; branches originating at about $^1/_3$ the length, all unpigmented; median branch relatively short and slender, with a distal swelling; lateral branches longer, bearing several filaments, some with swellings. Dorsal 22—24. Anal 44—45. Pectoral 1. Pelvic 7. Ventral photophores I.-P. 7—8; P.-V. 28; V.-A. 14; A.-C. 21; lateral, O.-V. 28—29; V.-A. 13—14.

Atlantic.

Two specimens, each 82 mm. in lenght to base of caudal, from Stations 1158 and 1166, with 500 and 100 metres of wire out. In the specimen from Station 1158 the barbel measures 16 mm., in that from Station 1166 20 mm.

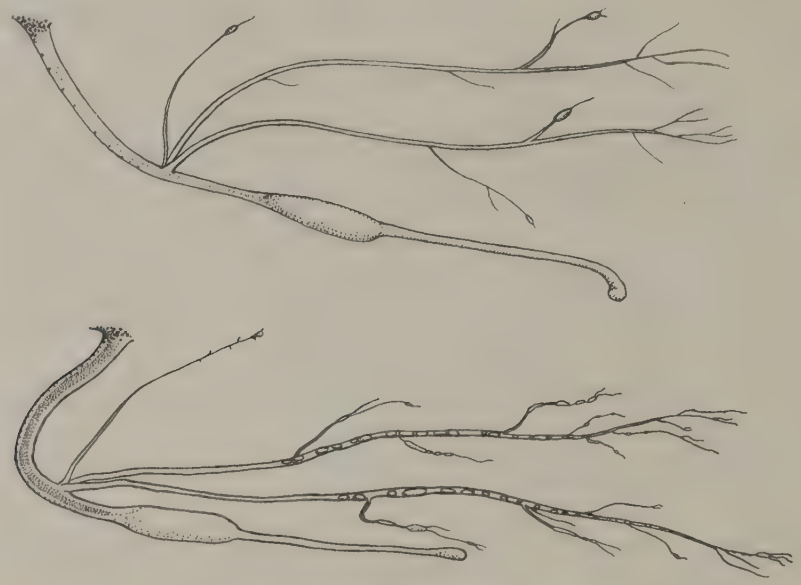


Fig. 102. *Eustomias monodactylus*; barbel.

A specimen of 58 mm. (fig. 101) from Station 1107 (M.W. 300) may belong to this species. D. 21; A. 38; Photophores O.-V. 30; V.-A. 14; A.-C. 20. Pectoral of one well-formed ray, one shorter fine ray, and 2 or 3 minute rays in the basal membranous fringe. Barbel as long as head, white; branches short and stout.

Another of 47 mm. (tail broken) from Station 1358 (M.W. 1000) has a similar barbel.

52. EUSTOMIAS FILIFER, Gilchrist, 1908.

Neostomias filifer, Gilchrist, Mar. Inv. S. Afri. IV, p. 168, pl. L.

Barbel nearly as long as fish, translucent, with black bodies inside at intervals, which towards the end resemble a string of beads; proximal part with an anterior series of black dots; a slight luminous

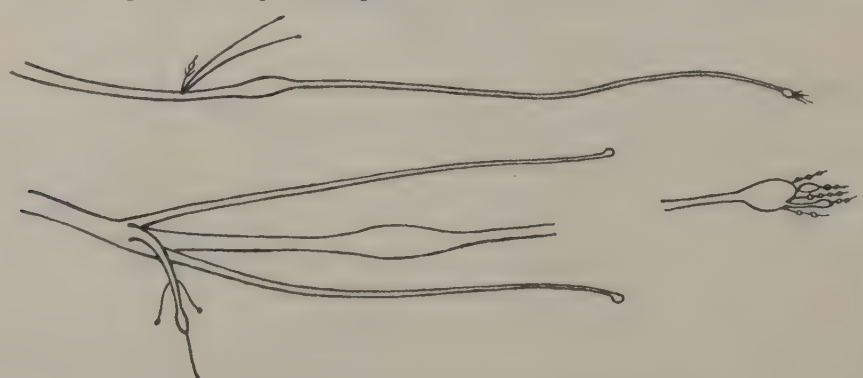


Fig. 103. *Eustomias filifer*; barbel of type (after Gilchrist).

swelling a little beyond the branches; a small terminal bulb that caries several filaments with bead-like swellings; branches at 1/5 the length; median short, less than 1/20 length of barbel, with a pair of filamentous branches, and ending in a bulb with a filament; latéral more than 3 times as long, slender, tapering, ending in minute bulbs. Dorsal 22. Anal 40. Pectoral 1. Pelvic 7. Photophores I.-C. ca. 67.

South Africa.

Length of type, to base of caudal, 230 mm.

A "Dana" specimen that probably belongs to this species, but differs somewhat from the type, is described below.

Depth of body 11 in the length, length of head 7 2/3. Diameter of eye 5 2/3 in length of head, interorbital width 6. Barbel (33 mm.) less than 1/2 length of fish, with pigmented axis; median branch with

Fig. 104. *Eustomias filifer*; barbel of "Dana" specimen.

long beaded filaments; lateral branches not longer than median to end of bulb. Dorsal 25. Anal 39. Pectoral of a long ray, with a minute one in its axil. Pelvic 7. Ventral photophores I.-P. 7; P.-V. 27; V.-A. 14; A.-C. 23; lateral, O.-V. 28; V.-A. 14.

Atlantic.

Station 1156, M.-W. 600. Length to base of caudal 77 mm.

12. HAPLOSTOMIAS, gen. nov.

Snout short. Cleft of mouth straight. Praemaxillaries and lower jaw with depressible fangs, simple, or with a rudimentary cusp. Maxillary with one or more erect teeth followed by a series of small oblique teeth. A pair of teeth on vomer, about 5 on each palatine, and two pairs on basibranchials; teeth on gill-arches well-developed, in pairs. Post-ocular luminous organ large. Dorsal 16—17. Anal 19—20. Dorsal and anal beginning at same vertical, but anal extending farther back. Pectorals normal, 5-rayed. Pelvics 7-rayed, their distance from end of snout about 3/5 length of fish.

Separated from *Melanostomias* mainly on the structure of the teeth.

1. HAPLOSTOMIAS TENTACULATUS, sp. n. (Pl. XI, fig. 1).

Depth of body 9 to 9 1/2 in the length, length of head 7 1/2 to 7 3/4. Diameter of eye 6 in length of head, as long as postocular luminous organ. Barbel 3 times as long as head, with black stem, and white ovate bulb with a terminal fringe of 7 to 10 minute filaments; axis of stem prolonged along edge of bulb, distally becoming free and forming a tentacle-like appendage. Dorsal 16—17. Anal 19—20. Pectoral 5. Pelvic 7. Photophores in ventral series, I.-P. 8 + 2; P.-V. 25—27; V.-A. 14—15; A.-C. 9—10; in lateral series, O.-V. 24—25; V.-A. 14.

Atlantic; Caribbean Sea.

Two specimens, one 100 mm. long to base of caudal, from Station 1168, with 300 metres of wire out, the other 89 mm. long to base of caudal, from Station 858, with 200 m. of wire out.

Three young specimens of 20—30 mm. (barbel $2^1/_4$ to $2^3/_4$ head) from Stations 1045, 1066, and 1190, 80 to 300 M.W., and a damaged specimen of 67 mm. from Station 1293, 100 M.W. (barbel $2^1/_2$ head) also belong to this species.

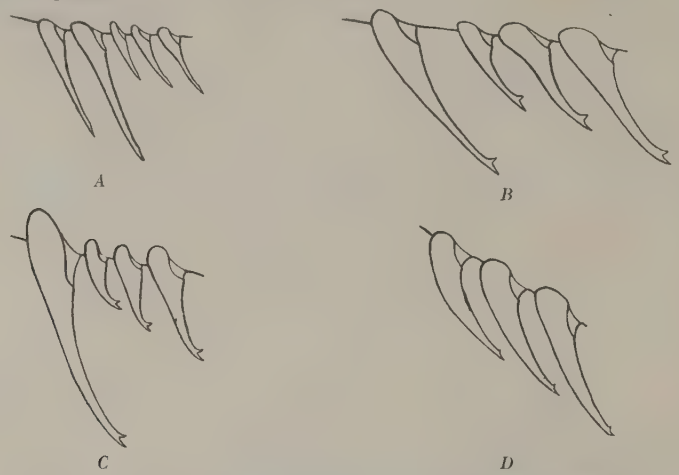


Fig. 105. Some praemaxillary fangs of *A. Haplostomias tentaculatus*; *B. Melanostomias spilorhynchus*; *C. Idiacanthus fasciola*; *D. Photonectes monodactylus.*

Fig. 106. End of barbel of *A. Haplostomias tentaculatus*; *B. H. bituberatus.*

2. HAPLOSTOMIAS BITUBERATUS, sp. n.

Depth of body about 7 in length, length of head about 6. Diameter of eye about 4 in length of head, a little longer than postocular luminous organ. Barbel $2^1/_4$ as long as head, with slender stem and two bulbs, a proximal and a larger distal; terminal part of axis adherent to proximal bulb, projecting as a tentacle-like appendage beyond it. Dorsal 17. Anal 20. Pectoral 5. Pelvic 7. Photophores in ventral series, I.-P. 8 + 2; P.-V. 25; V.-A. 15; A.-C. 10; in lateral series, O.-V. 24; V.-A. 14.

Atlantic.

A specimen only 20 mm. long to base of caudal, from Station 1064, with 110 mm. of wire out, distinguished from one of the same size of the preceding species by the structure of the barbel.

13. MELANOSTOMIAS, A. Brauer, 1902.[1]

Valdivia Tiefseefische, p. 53 (1906).

Snout short. Cleft of mouth straight. Praemaxillaries and lower jaw with depressible curved fangs, each with a pointed process near the end, so that these teeth may be described as bicuspid; maxillary with one or more erect teeth followed by a series of small oblique teeth. A pair of teeth on vomer, a series of 3 to 6 on each palatine, and usually two pairs on the tongue; teeth on gill-arches well-developed. Postocular luminous organ well developed. Dorsal 13—16. Anal 16—20. Dorsal and anal beginning in same vertical, but anal extending farther back. Pectorals normal, of 5 or 6 rays. Pelvics 7-rayed, far back, usually twice as distant from end of snout as from base of caudal.

[1] *Melanostomias bartonbeani*, Parr (Bull. Bingham Ocean. Coll. III, (2), 1927, p. 45, fig. 25) is based on a specimen with distal part of barbel missing. P.-V. 25. Probably *M. valdiviae* or an allied species. *Melanostomias braueri* Zugmayer is a *Photonectes.*

Synopsis of the Species:

I. Barbel with slender stem bearing a terminal bulb ..... 1. *niger.*

II. Barbel with a translucent distal part, generally expanded and laterally compressed, containing the end of the axis and one or more rounded or oval opaque white luminous bodies.

A. End of axis straight; barbel 5/6 to 1 1/2 length of head, with stem black, or black proximally and unpigmented distally. Photophores P.-V. 23—27.

Distal part of barbel with two strips of loose luminous tissue, one in front of axis, one behind; a white body at proximal end of anterior strip, another at distal end of posterior strip, at the base af a tapering terminal appendage that generally ends in a filament. P.-V. 23—25 ..... 2. *spilorhynchus.*

Distal part of barbel with two white bodies behind axis and one in front of it; a terminal filament. P.-V. 25 ..... 3. *valdiviae.*

Distal part of barbel with two white bodies behind axis, the distal much the larger, and with a strip of granular luminous tissue in front of axis; no filament. P.-V. 25 ..... 4. *melanocaulus.*

Distal part of barbel with two white bodies behind axis, the distal much the larger, and with a series of 6 small ones in front of axis; no filament. P.-V. 26—27 ..... 5. *heteropogon.*

B. Terminal part of axis forming a curve in front of luminous bulb, which has smaller luminous bodies proximal to it; a series of white luminous bodies anterior to axis. Photophores P.-V. 26—29.

Barbel twice as long as head; proximal 2/5 a pigmented stem; distal 3/5 with a series of white bodies behind axis, the last enlarged and in curve of axis; no filament. P.-V. 26—27 ..... 6. *biseriatus.*

Barbel 2 to 2 1/2 as long as head, unpigmented except at base; a large white bulb in curve of axis, with some small ones proximal to it; a terminal filament. P.-V. 27—29 ..... 7. *albibarba.*

C. End of axis inclined forward; a single luminous body behind it in a broad membranous expansion; barbel 2 to 3 times as long as head, unpigmented except at base. Photophores P.-V. 27—28.

Luminous bulb relatively small; membranous expansion produced, tapering, ending in a filament ..... 8. *melanops.*

Luminous bulb large; membranous expansion not tapering, without filament ..... 9. *margaritifer.*

D. Terminal part of axis forming a curve in front of the luminous bulb; no other luminous bodies proximal to it or in front of axis; barbel 1 2/3 to 2 length of head. Photophores P.-V. 27—28.

Stem of barbel black, with a white spot near proximal end of swollen cylindrical distal part; at end a translucent region containing bulb and curved part of axis; a terminal filament ..... 10. *melanopogon.*

Stem of barbel black, with a white ring at middle of length, and beyond this narrow translucent expansions in front of and behind the black stem, extending to the large luminous bulb. No filament ..... 11. *macrophotus.*

1. MELANOSTOMIAS NIGER, Gilchrist & von Bonde, 1924.

Fish. Mar. Biol. Surv. S. Afr. III, 1922, No. 7, p. 6, pl. II, fig. 2.

Depth of body 7 in the length, length of head 7. Diameter of eye 6 in length of head, equal to length of postocular luminous organ. Barbel twice as long as head, slender, ending in a white ovate bulb

with rounded end, about as long as eye. According to the figure dorsal with 10 rays, anal with 17. Pectoral 5. Pelvic 7. Photophores in ventral series, I.-C. 63; in lateral series, O.-V. 27; V.-A. 13.

S. Africa.

Length of type, 220 mm.

2. MELANOSTOMIAS SPILORHYNCHUS, sp. n. (Pl. X, fig. 1).

Depth of body 8 to 11 in length, length of head 6 to 8. Diameter of eye 5 to 6 in length of head, equal to or longer than postocular luminous organ; a bluish-white spot on middle of snout and generally one in front of each eye. Barbel $1^1/_5$ to $1^1/_2$ length of head, with the distal part ($^1/_3$ in young to $^1/_5$

Fig. 107. *Melanostomias spilorhynchus*; end of barbel.

in adult) swollen; stem and proximal end of swollen part black in adult, lightly pigmented in young, generally with one or two white spots near the base of stem; swollen part unpigmented distally, with straight axis, in front of and behind which is a strip of rather loose luminous tissue, and external to this a membrane, the anterior the broader, the posterior produced into a tapering appendage; a white bulb at the proximal end of the anterior strip of loose tissue, and another at the base of the distal appendage. Dorsal 14—15. Anal 18—20. Pectoral 5—6. Pelvic 7. Photophores in ventral series I.-P. 8 + 2—3; P.-V. 23—25; V.-A. 13—14; A.-C. 9—10; in lateral series O.-V. 23—24; V.-A. 13—14.

Atlantic.

Forty-eight specimens, 23 to 206 mm. in length to base of caudal from Stations 1019, 1020, 1027, 1028, 1031, 1033, 1034, 1043, 1044, 1045, 1067, 1141, 1142, 1147, 1152, 1160, 1161, 1163, 1366, 1378, with 65 to 1000 metres of wire out. A damaged specimen from Station 1140 (400 M.W.) probably belongs to this species.

3. MELANOSTOMIAS VALDIVIAE, A. Brauer, 1902.

Valdivia Tiefseefische, p. 56, text-fig. 16, pl. III, fig. 6 (1906).

Depth of body $7^1/_3$ in the length, length of head $7^1/_2$. Diameter of eye $5^1/_2$ in length of head, shorter than postocular luminous organ. Barbel $^5/_6$ length of head, with pigmented stem, and expanded translucent terminal part ending in a filament, with two subequal oval white bodies behind the straight axis, and one in front. Dorsal 13. Anal 18. Photophores in lateral series O.-V. 24; V.-A. 13.

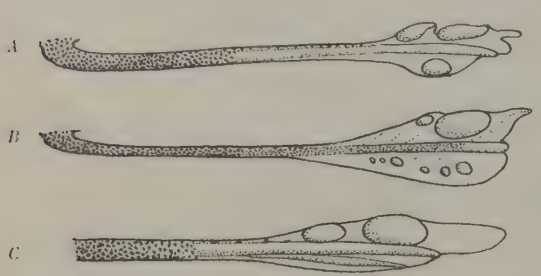


Fig. 108. *A. Melanostomias valdiviae*; barbel. *B. M. heteropogon*; barbel. *C. M. melanocaulus*; end of barbel.

Atlantic; Indian Ocean.

The above is abridged from Brauer's description of the type, 165 mm. in length to base of caudal, from the Indian Ocean.

A specimen in the collection of the Natural History Museum (GARDINER) from the Indian Ocean, 55 mm., is more slender than Brauer's type (depth 10, head 7 in the length), but agrees in the structure of the barbel, which is a little longer than the head, has the proximal half pigmented, and the tip of the axis white. One of 24 mm. from Station 1058 (110 M.W.) has a similar barbel, which is as long as the head. Both these specimens have two pairs of teeth on the tongue, as usual in the genus, and we have little doubt

that they should be referred to *M. valdiviae*, in spite of Brauer's statement that there are no teeth on the tongue in the type. In them we count D. 13—14; A. 18—19; P. 5; Pv. 7. Photophores in ventral series I.-P. 8 + 2; P.-V. 25; V.-A. 14—15; A.-C. 10; in lateral series O.-V. 24; V.-A. 13—14.

4. MELANOSTOMIAS MELANOCAULUS, sp. n.

Depth of body 10 in the length, length of head 7. Postocular luminous organ nearly as long as diameter of eye, which is 6 in length of head. Barbel $1^1/_4$ length of head, with slender black stem and compressed translucent terminal part, in which can be seen the straight axis, and posterior to it a considerable expansion containing a larger distal and a smaller proximal rounded white body; anteriorly a narrow expansion with a strip of granular luminous tissue. Dorsal 15. Anal 19. Pectoral 5. Pelvic 7. Photophores in ventral series, I.-P. 8 + 3; P.-V. 25; V.-A. 14; A.-C. 10; in lateral series, O.-V. 25; V.-A. 13.

Atlantic.

A single specimen, 55 mm. in length to base of caudal, from Station 947, with 900 metres of wire out.

5. MELANOSTOMIAS HETEROPOGON, sp. n.

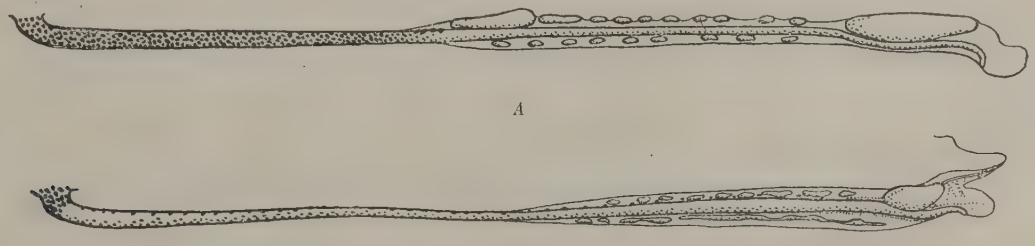
Depth of body nearly 10 in the length, length of head 7. Diameter of eye $5^1/_2$ in length of head, shorter than postocular luminous organ. Barbel $1^1/_6$ to $1^1/_3$ as long as head, with large expanded and compressed translucent terminal part; stem black proximally, then translucent with blackish axis; axis running through expansion, straight, proximally black, distally white and opaque; posterior to axis a large oval opaque white body, with or without a smaller one proximally; anterior to axis a series of 3 to 6 small unequal rounded white bodies. Dorsal 14. Anal 18. Pectoral 5. Pelvic 7. Photophores in ventral series, I.-P. 8 + 2; P.-V. 26—27; V.-A. 12—13; A.-C. 9; in lateral series, O.-V. 25; V.-A. 12.

Atlantic.

Two specimens, 45 and 62 mm. in length to base of caudal, from Station 1180, with 500 and 600 metres of wire out. One of 22 mm. (St. 1044, 110 M.W.) may belong to this species.

6. MELANOSTOMIAS BISERIATUS, sp. n.

Depth of body about 10 in the length, length of head 5 to 6. Diameter of eye 5 in length of head, shorter than postocular luminous organ. Barbel about twice as long as head; proximal $^2/_5$ pigmented; distal part of a white axis, with a narrow translucent band in front and behind, each including a series



A

B

Fig. 109. Barbel of *A. Melanostomias biseriatus*; *B. M. albibarba.*

of white luminous bodies; the posterior series starting proximally with a rather large white body, and ending with a larger one that curves the axis; beyond this white bulb and the end of the axis an expansion without a filament. Dorsal 13—16. Anal 16—17. Pectoral 5. Pelvic 7. Photophores in ventral series I.-P. 8 + 2; P.-V. 26—27; V.-A. 13—14; A.-C. 9—11; in lateral series, O.-V. 26; V.-A. 13.

Atlantic.

Four specimens, 20 to 25 mm. in length to base of caudal, from Station 1031, with 80 and 150 metres of wire out.

7. MELANOSTOMA ALBIBARBA, sp. n.

Melanostomias melanops (part.) Parr, Bull. Bingham Ocean. Coll. III, (2), 1927, p. 42, fig. 24.

Depth of body $7^1/_2$ to 10 in length, length of head 6 to $7^1/_2$. Diameter of eye 5 to 6 in length of head, as long as postocular luminous organ. Barbel (fig. 109, B) 2 to $2^1/_2$ length of head, unpigmented except at base, sometimes with black dots along the posterior surface; near end with translucent and compressed expansions, that on anterior side of axis narrow, with a series of small white bodies, that on posterior side of axis broader, with terminal filament, with a large oval white body that causes the axis to curve, and wih a series of smaller ones proximal to it. Dorsal 14—16. Anal 18—19. Pectoral 5. Pelvic 7. Photophores in ventral series I.-P. 8 + 2; P.-V. 27—29; V.-A. 13; A.-C. 10; in lateral series, I.-V. 26—28; V.-A. 12—13.

Atlantic; Caribbean Sea.

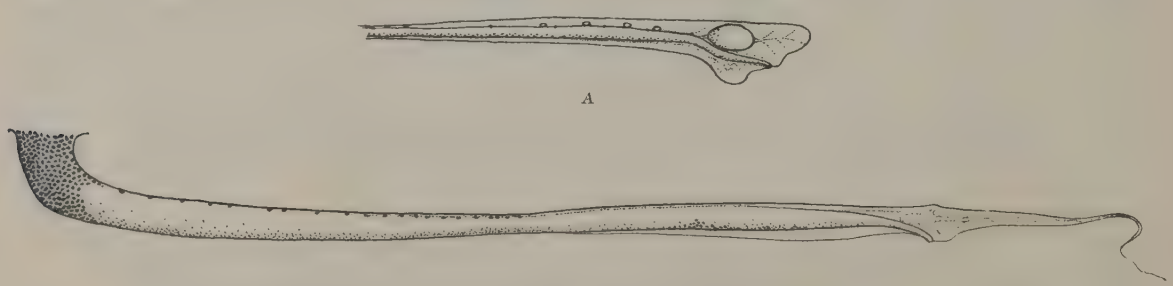
Described from 6 specimens, 40 to 60 mm. in length to base of caudal, from Stations 1183 (3000 M.W.), 1184 (300 M.W.), 1186 (300 M.W.), 1256 (600 M.W.), 1281 (100 M.W.), and 1368 (1000 M.W.). There are also some smaller specimens including one of 28 mm. from Station 1181 (4000 M.W.), and one of 30 mm. from Station 1183 (2500 M.W.); in five of 20—25 mm. from Station 1058 (110 M.W.), the barbel is less than twice as long as head, but has the same structure as in the larger ones.

Parr's specimens 2064 and 2065, with white barbel $2^1/_2$ as long as head, belong to this species; his others (2066 and 2067) with blackish barbel less than twice as long as the head, may be *M. melanopogon*.

8. MELANOSTOMIAS MELANOPS, A. Brauer, 1902.

Valdivia Tiefseefische, p. 53, text-fig. 15, pl. III, figs. 4, 5, (1906).

Depth of body about $8^1/_2$ in the length, length of head 7. Diameter of eye 6 in length of head, equal to length of postocular luminous organ. Barbel $2^1/_3$ as long as head; stem black near the base, elsewhere unpigmented except for a few spaced dots on posterior surface; distal part of barbel expanded



A

B

Fig. 110. *A. Melanostomias margaritifer*; end of barbel. *B. M. melanops*; barbel.

and compressed, tapering, ending in a long filament; expanded part translucent, with the opaque axis of the stem curved to end on its anterior edge, and with an elongate oval white body posteriorly, which gives rise to a thread that enters the filament. Dorsal (14) 15. Anal (17) 18. Pectoral 5. Pelvic 7. Photophores in ventral series, I.-P. 8 + 3; P.-V. 28; V.-A. 13; A.-C. 10; in lateral series, O.-V. 27; V.-A. 11.

Indian Ocean; Caribbean Sea.

Here described from a specimen 242 mm. in length to base of caudal, from Station 1285, with

1000 metres of wire out, which differs from Brauer's type (183 mm.) from the Indian Ocean only in being more slender (abdomen more distended in type) and in having the barbel somewhat shorter (nearly 3 times as long as head in type), and with the pigment spot at the end of the axis less developed.

9. MELANOSTOMIAS MARGARITIFER, sp. n.

Depth of body nearly 10 in the length, length of head $6^1/_3$ to $7^1/_4$. Diameter of eye $5^1/_3$ in length of head, as long as postocular luminous organ. Barbel 2 to $2^1/_4$ length of head, unpigmented except at base, a few dots on posterior side, and a minute spot at tip of axis; distally a small compressed translucent expansion anteriorly and a broad one posteriorly, including at its proximal end a large oval white body which bends the axis forward; no filament. Dorsal 15—16. Anal 18. Pectoral 5. Pelvic 7. Photophores in ventral series I.-P. 8 + 2; P.-V. 27—28; V.-A. 13—14; A.-C. 10; in lateral series O.-V. 27; V.-A. 13.

Western Atlantic; Caribbean Sea.

Two specimens, one 80 mm. long to base of caudal, from Station 950, with 200 metres of wire out, and one of 52 mm. from Station 1216, with 300 metres of wire out.

10. MELANOSTOMIAS MELANOPOGON, sp. n. (Pl. X, fig. 2).

? *Melanostomias melanops,* (part.) Parr, Bull. Bingham Ocean. Coll. III, (2), 1927, p. 42.

Depth of body 9 to 10 in the length, length of head $6^2/_3$ to $7^1/_2$. Diameter of eye 6 to 7 in length of head, about as long as postocular luminous organ. Barbel $1^2/_3$ length of head; distal half swollen,

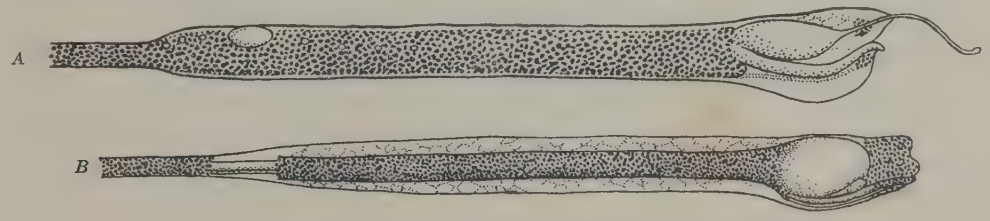


Fig. 111. End of barbel of *A. Melanostomias melanopogon*; *B. M. macrophotus.*

ending in a translucent compressed expansion containing a large ovate white bulb that curves the axis and is prolonged into a thread, which projects as a terminal filament that may end in a minute swelling; in adult, barbel black right up to the bulb, except for a white spot near proximal end of swollen part; pigment spots near end of axis and round thread from bulb; in young proximal part of stem black, swollen part lightly pigmented. Dorsal 14. Anal 17—19. Pectoral 4—5. Pelvic 7. Photophores in ventral series, I.-P. 8 + 2—3; P.-V. 27; V.-A. 13—14; A.-C. 9—10; in lateral series, O.-V. 26—28; V.-A. 12—14.

Atlantic.

A specimen 153 mm. long to base of caudal from Station 1334, with 300 metres of wire out, and two of 56 and 59 mm. from Station 1242, respectively with 1200 and 1500 metres of wire out. One of 27 mm. from Station 1063 (110 M.W.) has the barbel unpigmented.

This species is probably nearly related to *M. melanops,* resembling it in having a thread from the luminous bulb continued as a filament.

11. MELANOSTOMIAS MACROPHOTUS, sp. n.

Depth of body 10 in the length, length of head nearly 7. Diameter of eye 6 in length of head, a little longer than postocular luminous organ. Barbel $1^2/_3$ to $1^5/_6$ length of head; stem black except for a short white ring at about the middle of the length; beyond this with narrow anterior and posterior translucent expansions as far as the large, yellowish, oval bulb, beyond which there is a short, flat, black

expansion; axis curved by bulb, ending in a black spot; a minute luminous body between distal part of bulb and axis. Dorsal 14. Anal 18. Pectoral 5—6. Pelvic 7. Photophores in ventral series, I.-P. 8 + 2; P.-V. 27—28; V.-A. 13—14; A.-C. 9—10; in lateral series, O.-V. 26—27; V.-A. 13.

Western Atlantic; Caribbean Sea.

Two specimens, one 82 mm. long to base of caudal, from Station 1274, with 100 metres of wire out, the other, 62 mm. long to base of caudal, from Station 1256, with 500 metres of wire out. Seven specimens of 20 to 30 mm. from stations 952, 1178, 1184 and 1216, with 100—800 metres of wire out, also belong to this species.

14. **ECHIOSTOMA**, Lowe, 1843.

Proc. Zool. Soc. p. 87.

Hyperchoristus Gill, Proc. U. S. Nat. Mus. VI, 1883, p. 256.

As *Melanostomias*, but teeth of lower jaw in 2 or 3 series posteriorly, pectoral of 4 rays, the first isolated and produced, and pelvics 8-rayed. In all the species the distal part of the stem of the barbel, in adults, bears a double series of papilliform or filamentous processes.

Synopsis of the Species.

I. Barbel without, or with a single bulb.

Barbel with bulb not thicker than stem, bearing a simple flat terminal appendage; filaments on stem rather short. Postocular luminous organ $^1/_5$ length of head (in a specimen of 285 mm.) ..... 1. *barbatum.*

Barbel with distinct bulb and simple slender terminal appendage; filaments on stem long. Postocular luminous organ $^1/_4$ length of head (in a specimen of 215 mm.) ..... 2. *guentheri.*

Barbel without bulb, with slender tapering terminal appendage bearing two filaments; filaments on stem short and fleshy. Postocular luminous organ nearly $^1/_3$ length of head (in a specimen of 285 mm.) ..... 3. *ctenobarba.*

II. Barbel with two white bulbs, a longer proximal, and a shorter distal bearing terminal filaments ..... 4. *tanneri.*

1. ECHIOSTOMA BARBATUM, Lowe, 1843. (Pl. XI, fig. 2)

Proc. Zool. Soc., p. 88.

Depth of body $7^2/_3$ in the length, length of head 7. Diameter of eye 6, length of postocular luminous organ 5, in length of head. Maxillary with 6 fangs and 38 small oblique teeth; a pair of teeth on

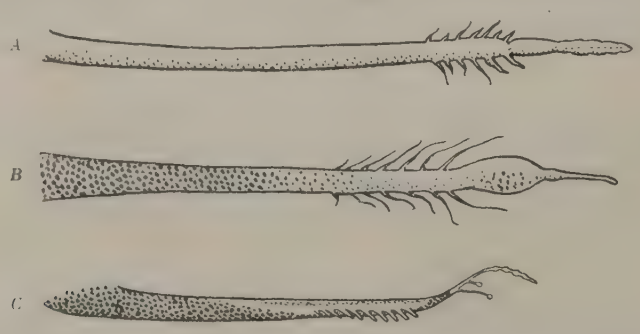


Fig. 112. Barbels of *Echiostoma*. *A. E. barbatum*; *B. E. guentheri*; *C. E. ctenobarba* (after Parr). (*A, B*, anterior view; *C*, lateral view).

vomer and a series of 9 on each palatine. Barbel $^3/_4$ length of head, with a rather elongate bulb not thicker than the stem, beyond which is a flat somewhat tapering terminal appendage; a double series of

about 8 fleshy filaments on stem immediately below the bulb. Dorsal 13. Anal 16. Pectoral 1 + 3. Pelvic 8. Photophores in ventral series I.-P. 8 + 2; P.-V. 26; V.-A. 17; A.-C. 11; in lateral series, O.-V. 25; V.-A. 17.

Madeira.

Here described from the type, a bleached specimen, 285 mm. in length to base of caudal.

2. ECHIOSTOMA GUENTHERI, sp. n.

Echiostoma barbatum (*non* Lowe) Günther, Cat. Fish. V, p. 427 (1864), and Challenger Deep Sea Fishes, p. 206, pl. LIII, fig. B. (1887).

Depth of body 8 in the length, length of head 7. Diameter of eye $6^1/_3$, length of postocular luminous organ 4, in length of head. Maxillary with 6 fangs and 22 small oblique teeth; a pair of teeth on vomer, and a series of 8 on each palatine. Barbel $^1/_2$ length of head, pigmented throughout, with slightly swollen bulb and slender tapering terminal appendage; a double series of 7 long tapering filaments on stem below the bulb. Dorsal 14. Anal 17. Pectoral 1 + 3. Pelvic 8. Photophores in ventral series I.-P. 8 + 2; P.-V. 26; V.-A. 17; A.-C. 11; in lateral series O.-V. 25; V.-A. 17.

Madeira.

A single specimen, 215 mm. in total length, in the British Museum (Natural History).

3. ECHIOSTOMA CTENOBARBA, Parr, 1927.

Bull. Bingham Ocean Coll., III, (2), p. 55, figs. 32, 33.

Depth of body $6^1/_2$ in the length, length of head $6^1/_2$. Diameter of eye 6 in length of head, length of postocular luminous organ $3^1/_4$. Maxillary with 5 fangs. A pair of teeth on vomer, and a series of 12 to 15 on each palatine. Barbel $^1/_2$ length of head, with slender tapering terminal part bearing a pair of filaments with swollen ends; proximal to this, stem with a double series of about 10 short and fleshy filaments. Dorsal 12. Anal 14. Pectoral 1 + 3. Pelvic 8. Photophores I.-P. 8 + 2; P.-V. 26; V.-A. 17; A.-C. 12.

Atlantic (23° 55′ N. 77° 09′ W.).

Length of type; 285 mm. to base of caudal.

4. ECHIOSTOMA TANNERI,[1] Gill, 1883.

Hyperchoristus tanneri Gill, Proc. U. S. Nat. Mus. VI, p. 256.

Echiostoma barbatum (*non* Lowe), Goode and Bean, Oceanic Ichthyology, p. 109, Pl. XXXV, fig. 130 (1895); Parr, Bull. Bingham Ocean. Coll. III (2), 1927, p. 53, fig. 31.

Depth of body $5^2/_3$ to $7^1/_2$ in the length, length of head 6 to $6^1/_2$. Diameter of eye 5 to 6 in length of head, length of postocular luminous organ from about $^1/_{20}$ (young) to $^1/_5$ length of head. Maxillary with 0 to 7 fangs, and 6 to 25 oblique teeth; a pair of teeth on vomer, and a series on each palatine, 8 in adults, 4 in young. Barbel from about $^2/_3$ to nearly as long as head, with pigmented stem; an elongate oval proximal bulb separated by a constriction from a much shorter, somewhat compressed and expanded distal bulb which bears four slender terminal filaments, ending in luminous expansions, arising close together, but divisible into a shorter lateral pair, always simple, and a longer median pair, one or both of which may bear one or two branches; distal part of stem with a double series of stout filaments (absent in young), which in the adult number 12 to 18 in each series and may be long and branched. Dorsal 12—16. Anal 15—19. Pectoral 1 + 3. Pelvic 8. Photophores in ventral series I.-P. 8 + 2; P.-V. 25—27; V.-A. 16—18; A.-C. 11—13; in lateral series O.-V. 24—26; V.-A. 16—18.

Atlantic; Gulf of Mexico; Caribbean Sea.

Ninety-two specimens, 20 to 223 mm. in length to base of caudal, from Stations 855, 858, 877,

[1] In taking Gill's name for this species we rely on Parr's statement that he has examined the type, and that it agrees in the structure of the barbel with the specimens he identified as *E. barbatum*. Gill's specific description is as follows:— "A black fish with formidable teeth, which was so lively when brought to the surface that it twisted itself round in its attempt to bite the commander of the vessel, Captain Tanner."

913, 934, 1165, 1168, 1183, 1216, 1218, 1223, 1225, 1228, 1229, 1230, 1231, 1245, 1270, 1342, 1353, 1360 and 1361, with 50 to 2000 metres of wire out. Those under 35 mm. are not included in the description.

In young specimens, up to about 90 mm. in length to base of caudal, there are either no filaments on the stem of the barbel, or at 75 to 90 mm. the distal pair may be represented by buds. In

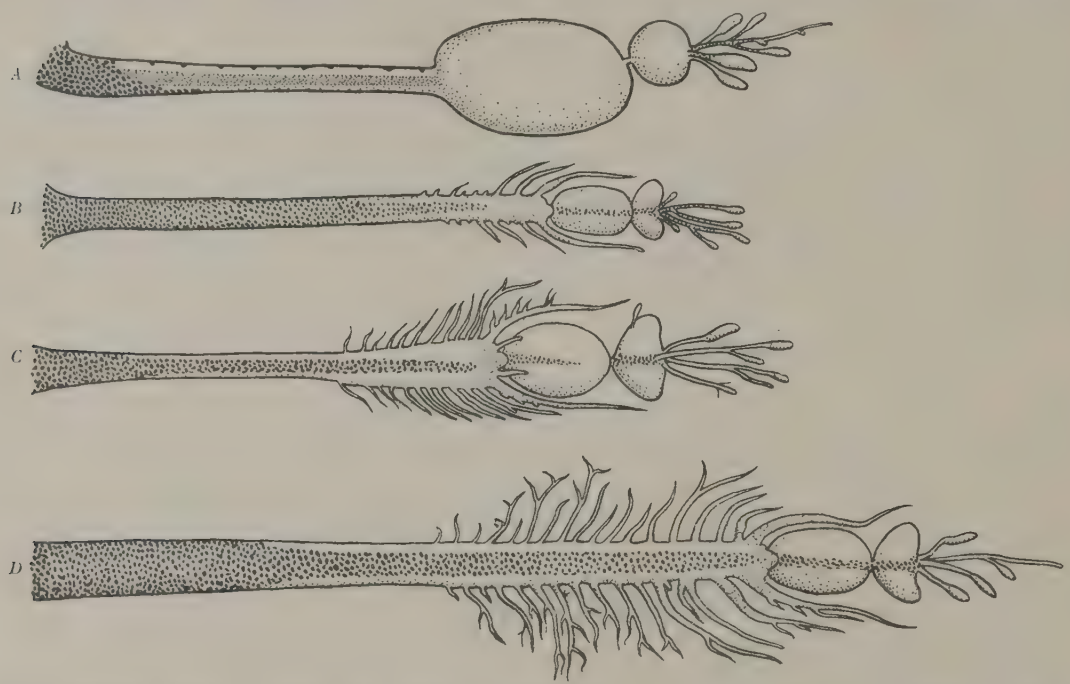


Fig. 113. *Echiostoma tanneri*. *A*. Lateral view of barbel of fish 39 mm. long (× 20). *B*. Anterior view of barbel of fish 133 mm. long (× 6). *C*. Anterior view of end of barbel of fish 142 mm. long (× 6). *D*. Anterior view of end of barbel of fish 223 mm. long (× 6).

specimens of 95 and 96 mm. there are 2 or 3 pairs of short filaments. In one of 133 mm. there are 3 or 4 long filaments on each side, and 4 to 6 buds. In larger specimens, 142 and 153 mm, there are 12 or 13 pairs of filaments, and in the 223 mm. specimen 15 to 18, several branched.

In young specimens the postocular organ is less than $^1/_2$ the diameter of the eye; in those of 142 and 153 mm. it is about $^2/_3$ the diameter of the eye, and only in the 223 mm. specimen does it exceed the diameter of the eye.

In young specimens the maxillary has a few oblique teeth, 6 to 9 in examples of 35 mm. In specimens of 75 to 95 mm. there are 3 or 4 fangs and about 15 oblique teeth. In larger ones, 130 to 223 mm. there are 6 or 7 fangs and 18 to 25 oblique teeth.

A specimen of 97 mm. from Station 1332, with 300 metres of wire out, has the distal bulb oblong and bearing a single long terminal filament. We regard this as an abnormal example of *E. tanneri*, perhaps with the end of the barbel regenerated.

15. **PHOTONECTES,** Günther, 1887.

Challenger Deep Sea Fishes, p. 212.
Lucifer (*non* J. V. Thompson) Döderlein, Arch. f. Naturgesch. 1882, p. 26.
Trachinostomias, Parr, Bull. Bingham Ocean. Coll. III (2), 1927, p. 105.
Dolichostomias, Parr l. c.

Distinguished from *Melanostomias* by the curved mouth and prominent lower jaw, by the smaller and more numerous teeth in the lower jaw, in groups of 3 to 5 increasing in length backwards, by the presence of 2 or 3 pairs of teeth instead of a single pair on each of the two first basibranchials, and by having the pectorals absent or reduced to 1 or 2 rays, sometimes with a minute third ray.

The species may be grouped into five subgenera, *Melanonectes*, subgen. nov., *Photonectes*, Günther, *Dolichostomias*, Parr, *Microchirichthys*, subgen. nov. and *Trachinostomias*, Parr.

Melanonectes is the most primitive subgenus, including species with 2 pectoral rays and resembling *Melanostomias* in the number and arrangement of the photophores, having a series of 7 or 8 along the isthmus separated by an interspace from 3 close together below the pectoral, the third of which is reckoned by us as the first of the P.-V. series. *Photonectes* is distinguished from *Melanonectes* by the absence of pectoral fins and by the photophores forming a continuous series from isthmus to pelvic fins. Its close relationship to *Melanonectes* is shown by the structure of the dorsal and anal fins, the membrane being thin and the rays conspicuous, by the number of photophores, I.-V. 30—37, and by the barbel, that of *P. achirus* being extremely similar to that of *P.* (*Melanonectes*) *leucospilus* and the barbels of other species showing various modifications of this type. *Dolichostomias* differs from *Photonectes* in the elongate form, long and low dorsal and anal fins, and more anterior pelvics.

In *Microchirichthys* and *Trachinostomias* the membrane of the dorsal and anal fins is thick and blackish, so that in adults only the tips of the rays are visible. The photophores from isthmus to pelvic fins form a continuous series and are more numerous than in the preceding subgenera (42 to 48 instead of 30 to 37). *Microchirichthys* has 2 minute pectoral rays and *Trachinostomias* a single long ray with a blade-like expansion near the end (? *P. margarita*) and in the young sometimes an additional minute ray.

Synopsis of the Species.

I. Membrane of dorsal and anal fins thin; rays conspicuous. Photophores I.-V. 30—37.

A. Pectoral fin of 2 rays, and sometimes a minute third ray (*Melanonectes*).

Barbel with small bulb bearing a slender translucent appendage ending in a second bulb, nearly as large as the first, with a pair of short filaments ..... 1. *dinema.*

Barbel with rather large bulb bearing a slender translucent appendage ending in a minute bulb without filaments ..... 2. *leucospilus.*

Barbel with large bulb bearing a small ovoid appendage ..... 3. *ovibarba.*

Barbel with small bulb bearing a minute knob ..... 4. *braueri.*

B. No pectoral fins.

1. Depth 6 to 9 in length; dorsal and anal fins relatively short; pelvics much nearer to caudal fin than to head (*Photonectes*).

Barbel shorter than head; stem black, bulb half black and half white, distal part slender, translucent, with white swelling at tip ..... 5. *achirus.*

Barbel shorter than head; no bulb; stem black, distal part slender, translucent, with white tip ..... 6. *caerulescens.*

Barbel shorter than head; stem short, black; bulb large, white; distal appendage with stalk and translucent leaf-like expansion ..... 7. *phyllopogon.*

Barbel as long as head; stem short, black; bulb white; distal part long, tapering, with luminous bodies; a terminal translucent expansion with a minute white body ..... 8. *mirabilis.*

Barbel longer than head; stem tapering; bulb small, white, with terminal filament ..... 9. *albipinnis.*

2. Depth $10^1/_2$ or more in length; dorsal and anal fins long and low; pelvics nearer to head than to caudal fin (*Dolichostomias*) ..... 10. *gracilis.*

II. Membrane of dorsal and anal fins thick, black; only tips of rays visible in adult. Photophores I.-V. 42—48.

A. Two minute pectoral rays (*Microchirichthys*).

Bulb of barbel spherical, much less than 1/2 length of stem. Photophores P.-V. 36—38; O.-V. 34—36 ..... 11. *parvimanus.*

Bulb of barbel oval, 1/2 length of stem. Photophores P.-V. 32—34; O.-V. 30 ..... 12. *fimbria.*

B. One long pectoral ray (? *P. margarita*), and sometimes in young a minute second ray (*Trachinostomias*).

1. Barbel with stout unbranched black stem, and broad compressed truncated white bulb bearing filaments ..... 13. *intermedius.*

2. Barbel without bulb, or with bulb scarcely thicker than the black stem, the distal part of which bears several long tapering pigmented branches.

Barbel with an oblong bulb, slightly thicker than stem, in the middle of its length; branches on bulb and distal to it ..... 14. *richardi.*

Barbel with a small bulb, not thicker than the stem, at 4/5 of its length, and another at end; branches between them ..... 15. *margarita.*

Barbel without bulb; a terminal filament, 2 pairs of long branches near base of filament, and proximal to these, close together anteriorly, 1 or 2 unpaired distal and 1 or 2 pairs of proximal branches ..... 16. *monodactylus.*

Barbel without bulb; a terminal filament, 1 1/2 or 2 pairs of lateral branches at some distance from it, and anteriorly, in the same region, a series of 4 pairs of branches ..... 17. *flagellatus.*

Subgenus MELANONECTES.

Membrane of dorsal and anal fins thin; rays conspicuous. Pectoral fin of 2 short rays and sometimes a minute third ray.

1. PHOTONECTES DINEMA, sp. n.

Depth of body 7 to 9 in the length, length of head 6 to 7. Diameter of eye 5 to 6 in length of head; postocular luminous organ 2/3 to as long as eye. Maxillary with 1 to 4 erect and 4 to 8 oblique teeth; two pairs of teeth on vomer and 1 to 3 teeth on each palatine. Barbel about 2/3 length of head;

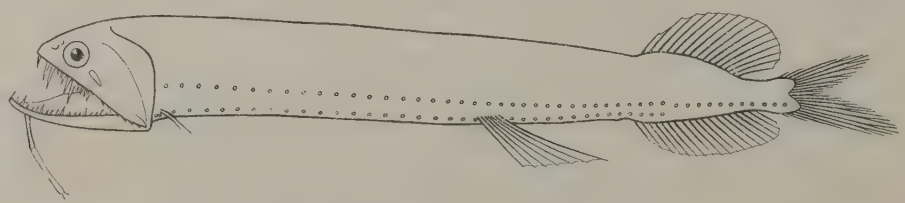


Fig. 114. *Photonectes dinema* (× 4).

stem pigmented; a white bulb scarcely thicker than stem, with a long translucent appendage; at its end a somewhat smaller bulb bearing a pair of short filaments. Dorsal 15—18. Anal 18—21. Pectoral of 2 short rays, and sometimes a minute third ray. Pelvics 7-rayed. Photophores in ventral series I.-P. 7—8 + 2; P.-V. 20; V.-A. 14—18; A.-C. 11—12; in lateral series O.-V. 17—20; V.-A. 14—17. A median white spot on snout.

Atlantic.

Ten specimens, 24 to 38 mm. in length to base of caudal, from Stations 855, 1031, 1156, 1322, 1327, 1330, 1334, 1353 and 1356 with 150 to 5000 metres of wire out.

2. PHOTONECTES LEUCOSPILUS, sp. n.

Depth of body 8 to 9 in the length, length of head 7. Diameter of eye 6 in the length of head; postocular luminous organ $^1/_2$ to $^2/_3$ as long as eye. Maxillary with 0 to 3 erect and 5 or 6 oblique teeth; two pairs of teeth on vomer and 2 teeth on each palatine. Barbel $^1/_2$ to $^2/_3$ length of head; stem black;

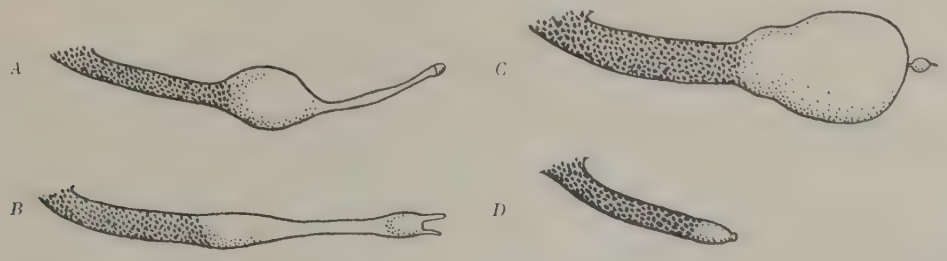


Fig. 115. Barbels of *Photonectes (Melanonectes)*. *A. P. leucospilus*; *B. P. dinema*; *C. P. ovibarba*; *D. P. braueri*.

a large oval white bulb bearing a rather long and slender translucent appendage with a very small white bulb at the end. Dorsal 16. Anal 20. Pectoral of 2 short rays, and sometimes a minute third ray. Pelvics 7-rayed. Photophores in ventral series I.-P. 8 + 2; P.-V. 23; V.-A. 14—15; A.-C. 10—11; in lateral series O.-V. 21—22; V.-A. 14. A median white spot on snout.

Atlantic.

Two specimens, 50 and 28 mm. in length to base of caudal, from Stations 1161 and 1358, with 300 and 2000 metres of wire out.

3. PHOTONECTES OVIBARBA, sp. n.

Depth of body 6 to 9 in the length, length of head 6 to 7. Diameter of eye 5 to 6 in length of head; postocular luminous organ as long as or shorter than eye. Maxillary with 1 or 2 erect and 3 to 6 oblique teeth; 2 pairs of teeth on vomer and 1 or 2 teeth on each palatine. Barbel about $^1/_2$ length of head, with short stout black stem and large white bulb, broadly rounded at end, bearing a small ovoid terminal appendage. Dorsal 15—17. Anal 17—21. Pectoral of 2 short rays. Pelvics 7-rayed. Photophores in ventral series I.-P. 7—8 + 2; P.-V. 21—23; V.-A. 14—15; A.-C. 11—12; in lateral series O.-V. 21—23; V.-A. 12—14.

Atlantic.

Eleven specimens, 22 to 31 mm. in length to base of caudal, from Stations 831, 837, 1142, 1148, 1152, 1242, 1322 and 1358, with 100 to 4000 metres of wire out.

4. PHOTONECTES BRAUERI, Zugmayer, 1913. (Pl. XII, fig. 1).

Melanostomias braueri, Zugmayer, Bull. Inst. Océan. Monaco, No. 253, p. 3.

Depth of body 8 in the length, length of head $7^2/_3$. Diameter of eye $4^1/_3$ in length of head, equal to length of postocular luminous organ. Maxillary with 9 erect and 10 oblique teeth; 2 pairs of teeth on vomer and 3 on each palatine. Barbel $^1/_5$ length of head, with stout black stem and small white bulb, not thicker than stem, bearing a minute terminal knob. Dorsal 18. Anal 20. Pectoral of 2 short rays. Pelvics 7-rayed. Photophores in ventral series I.-P. 8 + 2; P.-V. 22; V.-A. 15; A.-C. 10; in lateral series O.-V. 20; V.-A. 14.

Eastern Atlantic.

Described from the type, 115 mm. in length to base of caudal.

Subgenus PHOTONECTES.

Membrane of dorsal and anal fins thin; rays conspicuous. No pectoral fins. Pelvics much nearer to caudal fin than to head.

5. PHOTONECTES ACHIRUS, sp. n.

Depth of body 6 to $8^1/_2$ in the length, length of head 6 to $6^1/_2$. Diameter of eye 5 to 6 in length of head, as long as postocular luminous organ. Maxillary with 5 or 6 erect and 7 or 8 oblique teeth; two pairs of teeth on vomer and 1 to 3 on each palatine. Barbel $^1/_2$ to $^2/_3$ length of head, with pigmented stem, bulb black proximally and white distally, and long slender translucent terminal appendage with a small white swelling at its tip. Dorsal 15—17. Anal 18—19. No pectoral. Pelvics 7-rayed. Photophores in ventral series I.-V. 31—34; V.-A. 12—13; A.-C. 9—11; in lateral series O.-V. 19—21; V.-A. 11—12. Except in the smallest specimen, blue luminous tissue as in *P. caerulescens*.

Fig. 116. Barbel of *A. Photonectus achirus*; *B. P. caerulescens*.

Western Atlantic and Caribbean Sea.

Four specimens, 20 to 62 mm. in length to base of caudal, from Stations 1072, 1185, 1284, and 1285, with 150 to 1000 metres of wire out.

6. PHOTONECTES CAERULESCENS, sp. n. (Pl. XII, fig. 2).

Depth of body 7 in the length, length of head 7. Diameter of eye 4 in length of head; length of postocular luminous organ $^3/_4$ diameter of eye. Maxillary with 9 erect and 17 oblique teeth; two pairs of teeth on vomer and one tooth on each palatine. Barbel less than $^2/_5$ length of head, with black stem and slender translucent distal part with white tip; no bulb. Dorsal 18. Anal 21. No pectoral. Pelvics 7-rayed. Photophores in ventral series I.-V. 33; V.-A. 12; A.-C. 11; in lateral series O.-V. 21; V.-A. 11. A luminous blue mid-ventral stripe from chest to pelvics, giving rise to short transverse streaks alternating with the photophores. Small patches of blue luminous tissue on sides of isthmus, under lower jaw, and above end of maxillary.

Caribbean Sea.

A single specimen, 116 mm. in length to base of caudal, from Station 1269, with 2000 metres of wire out.

7. PHOTONECTES PHYLLOPOGON, sp. n.

Depth of body $8^1/_2$ in the length, length of head 6. Diameter of eye 5 in length of head; postocular luminous organ small. Maxillary with 2 or 3 oblique teeth; 2 pairs of teeth on vomer and a tooth on each palatine. Barbel $^2/_3$ length of head, with short black stem and large rounded white bulb bearing an appendage consisting of a pigmented cylindrical stalk and a distal translucent leaf-like expansion, with

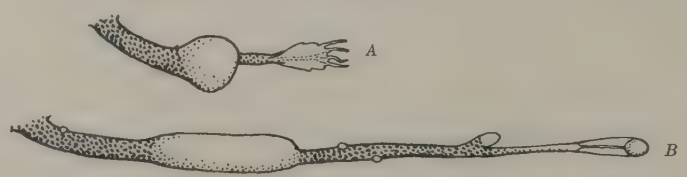


Fig. 117. Barbel of *A. Photonectes phyllopogon*; *B. P. mirabilis*.

serrated edges and four terminal filaments. Dorsal 20. Anal 22. No pectoral. Pelvics 7-rayed. Photophores in ventral series I.-V. 30; V.-A. 11; A.-C. 12; in lateral series O.-V. 19; A.-C. 12.

Caribbean Sea.

A single specimen, 21 mm. in length to base of caudal, from Station 1183, with 300 metres of wire out.

8. PHOTONECTES MIRABILIS, Parr, 1927.

Bull. Bingham Oeean. Coll. III (2), p. 111, figs. 59, 60.

Depth of body $6^2/_3$ in the length, length of head $7^1/_2$. Postocular luminous organ a little longer than diameter of eye, which is 4 in length of head. Maxillary with 4 erect and 15 oblique teeth; two pairs of teeth on vomer and two teeth on each palatine. Barbel as long as head, with short black stem bearing a small posterior luminous body, bulb, and long tapering terminal part, pigmented proximally, bearing three luminous bodies, and ending in a flat round translucent expansion with a minute white body at tip. Dorsal 16. Anal 19. No pectoral. Pelvics 7-rayed. Photophores in ventral series I.-V. 32: A.-C. 11; in lateral series O.-V. 24. A white spot in front of eye; three luminous patches on each side of anterior part of floor of mouth.

Atlantic (24° 45′ N. 76° 21′ W.).

Length of type, 60 mm. to base of caudal.

The above description is from Parr. The "Dana" collection includes a small example, 18 mm. to base of caudal, from Station 1352 (300 M.W.). It is extremely similar to the type, except that the bulb of the barbel is as long as the stem and the translucent terminal part is less expanded, with larger white body. Two luminous patches on each side of mouth. D. 17. A. 20. Photophores I.-V. 34, the first 8 close together.

9. PHOTONECTES ALBIPINNIS, Dõderlein, 1882.

Lucifer albipinnis, Dõderlein, Arch. f. Naturgesch. 1882, I, p. 26, pl. III.

Photonectes lucifer, Günth. Challenger Deep Sea Fishes, p. 212 (1887).

Depth of body 7 in the length, length of head 8. Postocular luminous organ nearly as long as diameter of eye, which is 5 in length of head. Barbel a little longer than head, slender, tapering, with small white bulb and terminal filament. Dorsal 13. Anal 15. No pectoral. Pelvics 7-rayed. Photophores in ventral series I.-V. 37; V.-A. 14; A.-C. 9; in lateral series O.-V. 25; V.-A. 13.

Japan.

Length of type 240 mm.

Sub-genus DOLICHOSTOMIAS.

Dorsal and anal fins long and low; membrane thin and rays conspicuous. No pectoral fins. Pelvics nearer to head than to caudal fin.

10. PHOTONECTES GRACILIS, Goode & Bean, 1895.

Oceanic Ichthyology, p. 112, pl. XXXVI, fig. 137; Parr. Bull. Bingham Ocean. Coll. III (2), 1927, p. 113, fig. 61.

Depth of body $10^1/_2$ to $15^1/_2$ in the length, length of head about 9. Snout short; diameter of eye 4 in length of head; postocular luminous organ a little shorter than eye. Maxillary with 17 erect and 12 to 14 oblique teeth; 4 or 5 teeth on each palatine. Dorsal 18—22. Anal 21—23; both fins long and low.

No pectoral. Pelvics 7-rayed, farther forward than in other species, nearer to head than to base of caudal. Photophores in ventral series I.-V. 32; V.-A. 15; A.-C. 13; in lateral series O.-V. 21; V.-A. 13. A blueish lateral band from head to caudal, a second below it posteriorly.

Western Atlantic.

Known from two specimens, 167 and 170 mm. in length to base of caudal. The barbel is broken off short in both.

Sub-genus MICROCHIRICHTHYS.

Membrane of dorsal and anal fins thick and black; only distal parts of rays visible in adults. Pectoral of two minute rays.

11. PHOTONECTES PARVIMANUS, sp. n.

Depth of body 8 to 10 in the length, length of head 7 to 8. Diameter of eye 6 to 7 in length of head; postocular luminous organ small, $^1/_3$ to $^3/_5$ as long as eye. Maxillary with 2 to 6 erect and 5 or 6 oblique

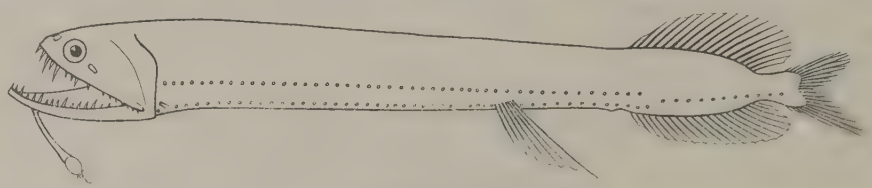


Fig. 118. *Photonectes parvimanus* (× 4).

teeth. 2 pairs of teeth on vomer, and a series of 4 to 6 on each palatine. Barbel about $^1/_2$ length of head to end of bulb, which is spherical, much less than $^1/_3$ the length of stem, and bears a translucent compressed distal appendage, which contains a network of branching threads, and in the adult has a fringe

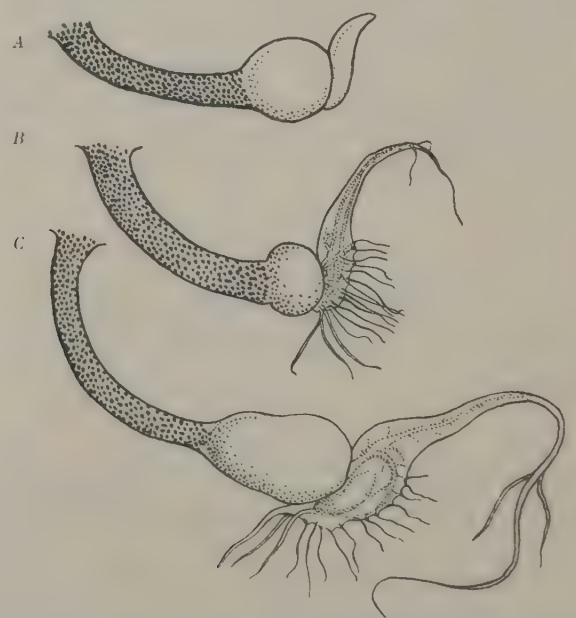


Fig. 119. Barbels of *Photonectes (Michrochirichthys). A. P. parvimanus* (young); *B. P. parvimanus*; *C. P. fimbria.*

of filaments along the posterior edge, and terminates in a long filament with one or two pairs of branches, which, like the filaments of the fringe, may end in luminous swellings. Dorsal 17—19. Anal 22—24. Pectoral of 2 minute rays. Pelvics 7-rayed. Photophores in ventral series I.-P. 10; P.-V. 36—38; V.-A. 12—14; A.-C. 11—13; in lateral series O.-V. 34—36; V.-A. 12—13. Sometimes a small white patch on shoulder.

Atlantic.

Ten specimens, 26 to 55 mm. in length to base of caudal, from Stations 855, 883, 891, 1018, 1019, 1358, and 1365, with 100 to 1000 metres of wire out.

12. PHOTONECTES FIMBRIA, sp. n.

Depth of body 9 in the length, length of head 8. Diameter of eye 7 in length of head; postocular luminous organ $^1/_2$ as long as eye. Maxillary with 7 or 8 erect and 6 to 8 oblique teeth. 2 pairs of teeth on vomer and a series of 3 to 5 on each palatine. Barbel $^1/_2$ length of head to end of bulb, which is large, oval, $^1/_2$ as long as the stem, and bears a compressed translucent distal appendage tapering to a long filament with a pair of branches; proximal part of appendage with branching threads within, and with a fringe along the posterior edge, the proximal filament of which is enlarged and originates from an opaque body. Dorsal 18. Anal 23. Pectoral of 2 minute rays. Pelvics 7-rayed. Photophores in ventral series I.-P. 10; P.-V. 33—34; V.-A. 14; A.-C. 12; in lateral series O.-V. 30; V.-A. 12. An irregular luminous patch on shoulder, on one side divided into an upper and a lower.

Atlantic.

A single specimen, 55 mm. in length to base of caudal, from Station 1148, with 500 metres of wire out.

Sub-genus TRACHINOSTOMIAS.

Membrane of dorsal and anal fins thick, black; only tips of rays visible in adults. Pectoral of one long ray with an expansion near end; sometimes a minute second ray.

13. PHOTONECTES INTERMEDIUS, Parr, 1927.

Bull. Bingham Ocean. Coll. III (2), p. 109, figs. 57, 58.

Depth of body 10 to 11 ($9^3/_8$ to $12^3/_4$) in length, length of head 7 to $8^1/_2$. Diameter of eye 6 to $7^1/_2$ in length of head; postocular luminous organ small. Maxillary with 7 to 13 erect and 5 to 7 oblique

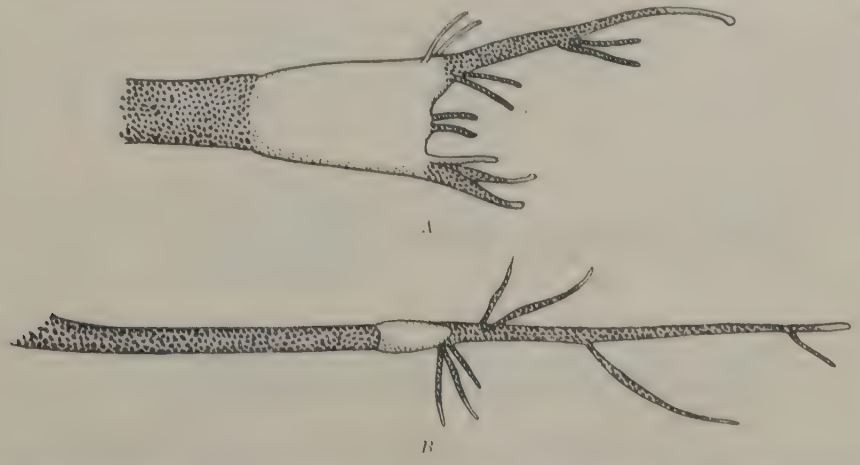


Fig. 120. *Photonectes (Trachinostomias). A. P. intermedius*; end of barbel; *B. P. richardi*; barbel.

teeth; one or two pairs of teeth on vomer and 2 to 5 teeth on each palatine. Barbel (fig. 120, A) $^2/_5$ to $^2/_3$ length of head, with stout black stem and compressed white bulb, broadest distally and truncated, generally somewhat obliquely, at end; distally a posterior pigmented tentacle-like appendage, usually with white tip, with or without a branch, or a pair of filaments, or of short club-shaped appendages, and an anterior pair of "tentacles" generally shorter than the posterior one; sometimes a pair of unpigmented filaments proximal to base of posterior "tentacle", generally a pair of pigmented filaments at its base, and another pair at base of anterior pair; edge between "tentacles" with or without one unpigmented and two or three pigmented filaments. Dorsal 16—19. Anal 18—24. Pectoral of one long ray, when complete with an expansion near the end. Pelvics 7-rayed. Photophores in ventral series I.-P. 8—11; P.-V. 33—35; V.-A. 12—13; A.-C. 11—12; in lateral series O.-V. 31—34; V.-A. 11—14. Adults with two luminous patches on shoulder.

Atlantic.

Fourteen specimens. 33 to 86 mm. in length to base of caudal, from Stations 863, 878, 1043, 1341, 1342, 1345, 1353 and 1358, with 150 to 2000 metres of wire out. Five small specimens 20 to 30 mm. to base of caudal, from Stations 1031, 1184, 1229, and 1231, also belong to this species. Three from Stations 1044 and 1157, 24 to 33 mm. to base of caudal, have an additional minute pectoral ray on one or both sides.

14. PHOTONECTES RICHARDI, Zugmayer, 1913.

Echiostoma richardi Zugmayer, Bull. Inst. Océan. Monaco. No. 253, p. 4.

Depth of body $7^1/_2$ in the length, length of head $7^3/_4$. Diameter of eye 7 in length of head; length of postocular luminous organ $^2/_3$ diameter of eye. Maxillary with 13 or 14 erect and 12 or 13 oblique teeth; a pair of teeth on vomer and 3 or 4 on each palatine. Barbel (fig. 120, B) as long as head, black, with unpigmented tip; at middle of its length an oblong bulb a little thicker than stem, bearing distally a pair of branches and a median branch; stem beyond bulb with a pair of lateral branches proximally, a long unpaired anterior branch near the middle of its length, and a shorter one near the end; just proximal to this last branch a small luminous body; all the branches pigmented, and, when complete, with white tips. Dorsal 19. Anal 22. Pectoral of one long ray (present on left side only). Pelvics 7-rayed. Lateral photophores O.-V. 28—30; V.-A. 14.

Eastern Atlantic.

Here described from the type, 170 mm. in length to base of caudal.

15. PHOTONECTES MARGARITA, Goode and Bean, 1895.

Echiostoma margarita, Goode and Bean. Oceanic Ichthyology, p, 109, fig. 131.

Photonectes margarita, Parr, Bull. Bingham Ocean. Coll. III (2), 1927, p. 106, fig. 55 B.

Depth of body nearly equal to length of head, $6^3/_4$ in the length. Diameter of eye 7 in length of head. Maxillary with 20 to 25 erect teeth; 1 or 2 pairs of teeth on vomer, and about 6 teeth on each

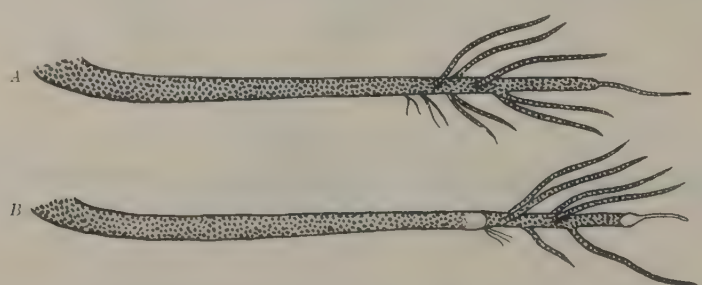


Fig. 121. Photonectes (*Trachiostomias*). Barbel of *A. P. flagellatus*; *B. P. margarita* (both after Parr).

palatine. Barbel a little more than $^1/_2$ length of head, black; at $^4/_5$ of its length a luminous body bearing three short filaments, and at end another bearing a small white filament; stem between luminous bodies with two unpaired anterior and two pairs of lateral, long black tapering branches. Dorsal 19. Anal 24. No pectoral? Pelvics 7-rayed. Photophores in ventral series I.-V. 45; V.-A. 12; in lateral series O.-V. 30; V.-A. 11—12.

Gulf of Mexico.

The type measures 320 mm. to base of caudal.

The evident close relationship of this species to *P. monodactylus, P. richardi,* etc. and the circumstance that we have seen two specimens of *P. monodactylus* in which the pectoral fin of one side is missing, without leaving any trace, leads us to suspect that the absence of pectoral fins in the type of *P, margarita* may be accidental.

16. PHOTONECTES MONODACTYLUS, sp. n. (Pl. XII, fig. 3).

Depth of body 7 in the length, length of head 7. Diameter of eye 6 in length of head; postocular luminous organ $^3/_4$ as long as eye. Maxillary with 16 erect and 4 or 5 oblique teeth; a pair of teeth on

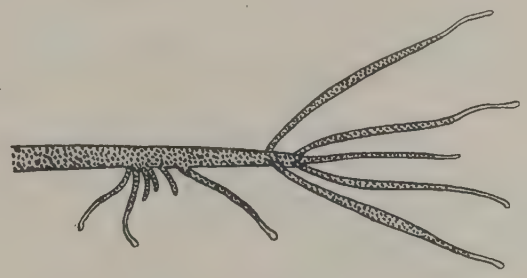


Fig. 122. *Photonectes monodactylus*; end of barbel.

vomer and a series of 3 to 5 on each palatine. Barbel $^1/_2$ length of head (to end of terminal filament); at its distal end with two pairs of branches, longer and stronger than the terminal filament, tapering, black, with slightly dilated unpigmented ends; at a little distance from these, on anterior part of stem, six similar but shorter branches, a longer distal and shorter proximal unpaired, and shorter distal and longer proximal pairs. Dorsal 18. Anal 23. Pectoral of one long ray (incomplete). Pelvics 7-rayed. Photophores in ventral series I.-P. 10; P.-V. 34; V.-A. 12; A.-C. 9.

Atlantic; Caribbean Sea.

Described from a single specimen, 250 mm. in length to base of caudal, from Station 1242, with 4000 metres of wire out. A second specimen, 250 mm. to base of caudal, from Station 1186 (1000 M.W.) has the end of the barbel broken off, and only one unpaired anterior branch with one pair proximal to it. Dorsal 19. Anal 21. Pectoral ray nearly $^1/_4$ length of fish, with an expansion near tip. Photophores I.-P. 9; P.-V. 33; V.-A. 11.

Three specimens, 180 to 255 mm. in length to base of caudal, from Stations 1156, 1172 and 1223, with 600 to 1000 metres of wire out, have the barbel broken, but agree with this species in the number of photophores and of fin-rays (D. 17—18; A. 23; P. 1.) In two of them one pectoral ray is missing, and no trace of it can be seen.

17. PHOTONECTES FLAGELLATUS, Parr, 1927.

Bull. Bingham Ocean. Coll. III (2),p. 107, figs. 55 A and 56.

Depth of body 7 in the length, length of head $7^2/_5$. Postocular luminous organ shorter than diameter of eye, which is $6^1/_3$ in length of head. Maxillary with 18 erect teeth; a pair of teeth on vomer

and 6 or 7 on each palatine. Barbel (fig. 121, A) $^4/_5$ length of head, black, with long terminal filament; distal half with a series of four anterior and $1^1/_2$ (or 2) pairs of lateral, tapering branches. Dorsal 18. Anal 22. Pectoral of one long ray, nearly $^1/_4$ length of fish, with flat terminal expansion. Pelvics 7-rayed. Photophores in ventral series I.-P. 11; P.-V. 32; V.-A. 11; in lateral series O.-V. 30—31; V.-A. 12.

Atlantic (22° 43′ N. 74° 23 W′.)

Length of type, 280 mm. to base of caudal.

16. **Idiacanthus,** Peters 1876.

Monatsb. Akad. Berlin, p. 847.

Bathyophis, Günther, Ann. Mag. Nat. Hist. II, 1878, p. 181.

Very elongate. Cleft of mouth slightly curved; lower jaw projecting. Praemaxillary and lower jaw with a single series of unequal, depressible, bicuspid teeth; maxillary with a series of minute oblique teeth; a pair of teeth on vomer, a short series on each palatine, and two pairs on basibranchials. No teeth on

Fig. 123. *Idiacanthus fasciola*; barbel.

gill-arches. Dorsal 54—74, long, extending forward nearly to or in advance of pelvics. Anal 34—49, shorter than dorsal. Dorsal and anal rays rather wide-set, except posteriorly; a pair of spiny projections at the base of each. Pectorals absent; pelvics 6-rayed.

In all the species the barbel has the following structure:—

Proximal $^2/_3$ black, slender; distal part white or lightly pigmented, thicker, tapering to a fine point, bearing anterior and posterior membranous expansions and proximally a pair of oblique lateral membranes; near the base of the swollen part a short slender white anterior branch, flanked by a pair of membranous lobes, distal to which it bears one conspicuous and a few minute luminous bodies.

Synopsis of the species.

I. Pelvics well in advance of dorsal ..... 1. *niger.*

II. Pelwics below or behind origin of dorsal.

Pelvics below first to eighth ray of dorsal, their distance from anal more than $^1/_2$ their distance from snout; 15 to 18 photophores from pelvics to origin of anal ..... 2. *fasciola.*

Pelvics below fifth to tenth ray of dorsal, their distance from anal at least $^3/_4$ their distance from snout; 16 to 22 photophores from pelvics to origin of anal ..... 3. *panamensis.*

Pelvics a little behind origin of dorsal, their distance from anal less than $^1/_2$ their distance from snout; 22 photophores from pelvics to origin of anal ..... 4. *atlanticus.*

Pelvics well behind origin of dorsal, their distance from anal $^1/_2$ their distance from snout ..... 5. *antrostomus.*

1. IDIACANTHUS NIGER, Regan, 1914.

Ann. Mag. N. H., (8) XIII, p. 14 and (8) XVIII, 1916, p. 377; Terra Nova Exped. Fishes, p. 14, pl. X, fig. 2 (1914); Archey N. Z. Journ. Sc. Techn., V, 1922, p. 295.

Idiacanthus retrodorsalis, Thompson, Proc. U. S. Nat. Mus., L, 1916, p. 462, pl. 4, fig. 2.

Depth of body 24 in the length, length of head 14 to 15. Diameter of eye 7 to 8 in length of head. Barbel 2 to $2^1/_2$ length of head. Dorsal 55—60. Anal 36—38. Pelvics well in advance of dorsal,

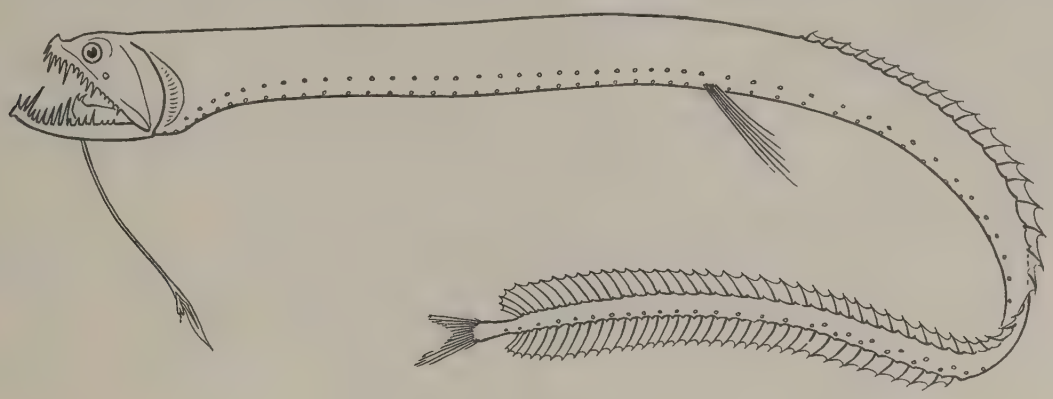


Fig. 124. *Idiacanthus niger* (after Regan).

their distance from origin of anal four-fifths their distance from end of snout. Ventral photophores I.-V. 39—40; V.-A. 35 (20 or 21 to origin of anal); A.-C. 17; lateral, O.-V. 28; V.-A. 35.

New Zealand; Chile.

Length of type 380 mm. to base of caudal; snout to dorsal 170 mm.; snout to pelvics 150 mm.; pelvics to anal 120 mm.; origin of anal to base of caudal 110 mm. A second specimen from New Zealand, 347 mm. to base of caudal, has been described by Archey; this like, the type, was taken from the stomach of a "groper". The type of *I. retrodorsalis*, taken off Chile, is 125 mm. long from snout to anus; part of the tail has been lost; the figure shows series of conspicuous luminous patches along the body, much as in *I. panamensis*.

2. IDIACANTHUS FASCIOLA, Peters, 1876.

Monatsb. Akad. Berlin, p. 847; Brauer, "Valdivia" Tiefseefische, p. 60, figs. 17—20 (1906): Parr, Bull. Bingham Ocean. Coll. III, (2) 1927, p. 116, fig. 62.

Bathyophis ferox, Günther, Ann. Mag. Nat. Hist., II, 1878, p. 181.

Idiacanthus ferox, Günther, Challenger Deep Sea Fishes, p. 216, pl. LII, fig. D (1887).

? *Idiacanthus aurora*, Waite, Austral. Antarctic Exped. Fishes, p. 53, pl. V, fig. 1 (1916); Archey, N. Z. Journ. Sc. Techn., V, 1922, p. 296.

Depth of body 19 to 27 in the length, length of head 15 to 18. Diameter of eye 5 (young) to 7 in length of head. Barbel 2 to $2^1/_2$ length of head; anterior filament with a prominent swelling. Dorsal

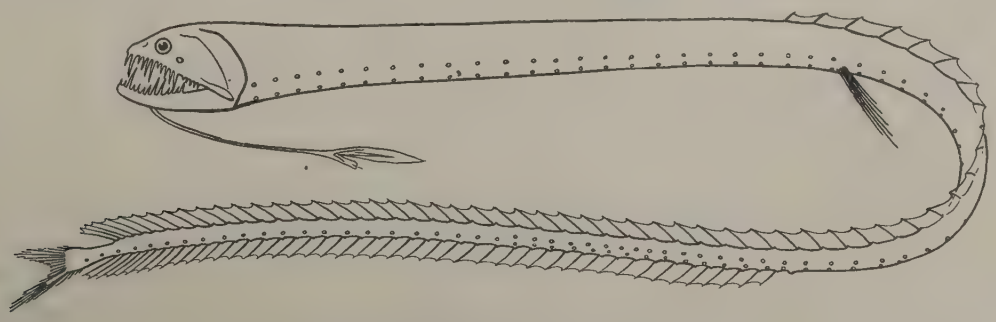


Fig. 125. *Idiacanthus fasciola* ($\times$ $^2/_3$).

54—74. Anal 38—49. Pelvics inserted below first to eighth ray of dorsal, their distance from anal from a little more than 1/2 to nearly as long as their distance from end of snout, which is 2 1/2 to 3 in length of fish, about equal to distance from origin of anal to caudal. Ventral photophores I.-V. 33—36; V.-A. 30—36 (15—18 to origin of anal); A.-C. 14—18; lateral O.-V. 21—25; V.-A. 30—36. A small faint white patch below postocular luminous organ and three longitudinal series of similar patches along body, invisible to the naked eye; a knot of similar tissue on upper surface of caudal peduncle; an oblong yellow body, with a smaller one, in lower lobe of caudal fin. First pelvic ray black with white patches.

Western Pacific (N. of New Guinea, N. of Australia); Indian Ocean; Atlantic Ocean; Gulf of Mexico; Caribbean Sea; ?Antarctic Ocean.

Here described from the type of *I. ferox*, 195 mm. in length to base of caudal, a specimen of 104 mm. from the Indian Ocean, and 250 specimens, 46 to 276 mm. in length to base of caudal, from

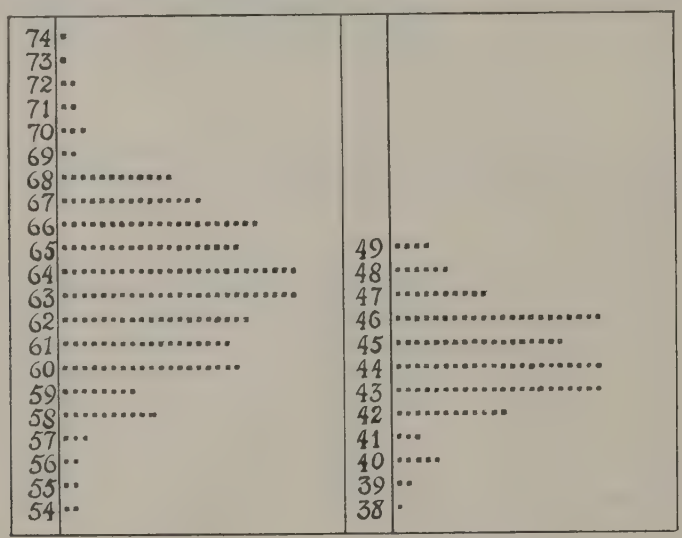


Fig. 126. *Idiacanthus fasciola*. Number of rays of dorsal fin (*D*) of 209 specimens, and in anal fin (*A*) of 127 specimens.

stations 65, 442, 678, 813, 817, 830, 832, 837, 855, 856, 858, 863, 865, 883, 885, 886, 888, 889, 895, 897, 904, 907, 908, 911, 913, 926, 927, 928, 929, 934, 937, 947, 948, 949, 950, 951, 952, 1018, 1019, 1031, 1033, 1042, 1043, 1044, 1045, 1057, 1058, 1059, 1060, 1064, 1073, 1153, 1155, 1156, 1157, 1178, 1182, 1184, 1185, 1186, 1190, 1192, 1194, 1198, 1206, 1217, 1223, 1239, 1242, 1250, 1256, 1257, 1261, 1269, 1270, 1273, 1274, 1280, 1282, 1283, 1289, 1291, 1293, 1294, 1296, 1310, 1314, 1320, 1321, 1322, 1326, 1332, 1334, 1335, 1342, 1345, 1352, 1353, 1355, 1356, 1360, 1372 and 1379, with 0—3000 metres of wire out.

30 post-larval specimens, 33—44 mm. long, are from stations 1006, 1156, 1159, 1181, 1183, 1185, 1186, 1189, 1217, 1239, 1242, 1261, 1267, 1283, 1322, 1358, 1365, with 300—5000 metres of wire out.

The variation in the number of dorsal and anal rays is shown in figure 126. The number of dorsal rays in front of the pelvics is also shown (fig. 127, B); the specimen with 7 dorsal rays in advance of the pelvics has 73 dorsal and 43 anal rays; in the four with six rays in advance of the pelvics the fin-rays number respectively D. 63, A. 44; D. 67, A. 47; D. 72, A. 45, and D. 74, A. 49.

The distance from pelvics to anal is generally between 60 and 90 % of that from the end of the snout to the pelvics; of 50 specimens exactly measured, two only are outside these limits, one having the distance from the pelvics to anal 55 %, the other 98 %, of that from end of snout to pelvics.

Idiacanthus aurora is based on a dilapidated specimen, 408 mm. in length to base of caudal, from off Macquarie Island. The skin has been torn off, so that the photophores cannot be counted; the pelvics are said to be below the origin of the dorsal, but having floated off with the skin their exact position is uncertain.

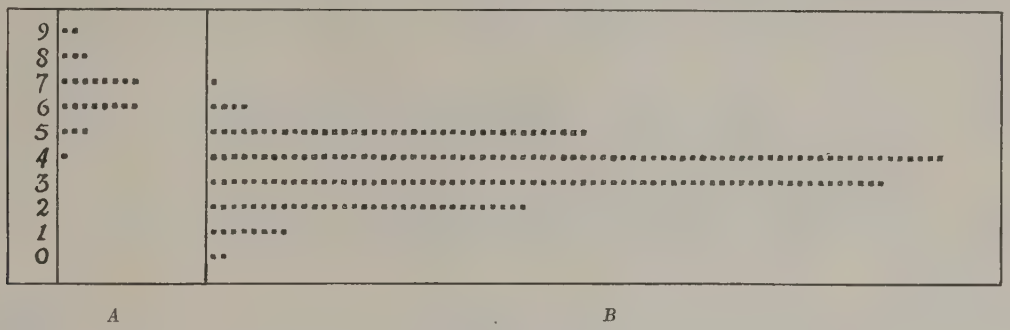


Fig. 127. Number of dorsal rays in front of pelvics in *A. Idiacanthus panamensis* (25 specimens), and *B. I. fasciola* (227 specimens).

3. IDIACANTHUS PANAMENSIS, sp. n. (Pl. VI, fig. 2).

Idiacanthus antrostomus (*non* Gilbert) Garman, Mem. Mus. Comp. Zool., XXIV, (1899) p. 280.

Depth of body 18 to 25 in the length; length of head 12 to 15. Diameter of eye $5^2/_3$ to 8 in length of head. Barbel $1^2/_3$ to $2^1/_3$ length of head; swelling on anterior filament smaller than in *I. fasciola*. Dorsal 54—67. Anal 34—39. Pelvics inserted below fifth to tenth ray of dorsal, their distance from snout $2^2/_5$ to 3 in length of fish, generally a little greater (in one specimen a little less) than their distance from origin of anal; distance from origin of anal to caudal 3 to $3^1/_2$ in length of fish. Ventral photophores I.-V. 32—36; V.-A. 29—36 (16—22 to origin of anal); A.-C. 16—21; lateral O.-V. 22—24; V.-A. 30—34. A conspicuous bluish white streak below post-ocular luminous organ, extending forward to below eye; three longitudinal series (two posteriorly) of bluish white patches on body, the two lower series alternating with the ventral and lateral photophores; bases of caudal rays densely covered with minute yellowish bodies; an oblong yellow body in lower caudal lobe. First pelvic ray black, with white patches.

Gulf of Panama.

Thirty-two specimens, 45 to 298 mm. in length to base of caudal, from Stations 1203, 1206, 1208 and 1209, with 800 to 3600 metres of wire out. Also 19 post-larval specimens, 37 to 54 mm. long, from Stations 1206, 1208 and 1209, with 2000 to 4000 metres of wire out.

Garman has identified this species with Gilbert's *I. antrostomus*, but according to Gilbert in that species the distance from pelvics to anal is $^1/_2$ that from snout to pelvics, whereas in none of the "Dana" specimens is the distance from pelvics to anal less than $^3/_4$ that from snout to pelvics. The shorter barbel may also characterize *I. antrostomus*. Gilbert's words "no evident phosphorescent spot on the cheek", and his omission to mention the longitudinal series of luminous patches which are so conspicuous in *I. panamensis* also indicate the probability that his species is not this one.

As is shown in the table (fig. 127), the average number of dorsal and anal rays is less, although the number of dorsal rays in advance of the pelvics is greater, than in *I. fasciola*. In the greater development of luminous tissue as compared with the Atlantic species, *I. panamensis* resembles another species from the Gulf of Panama, namely *Chauliodus barbatus*, which is also thus distinguished from its Atlantic allies.

4. IDIACANTHUS ATLANTICUS, A. Brauer, 1902.

"Valdivia" Tiefseefische, p. 62, fig. 21, (1906).

Length of head $14^1/_2$ in length of fish. Diameter of eye 7 in length of head. Dorsal 54, beginning a short distance in advance of pelvics. Anal 35. Pelvics more than twice as distant from tip of snout

as from vent; white spots on first ray. Ventral photophores I.-V. 40; V.-A. 38 (22 to origin of anal); A.-C. 18; lateral O.-V. 28; V.-A. 38.

S. E. Atlantic (25° 25′ S. 6° 12′ W.).

Length of type, 204 mm. to base of caudal; snout to dorsal 90 mm.; snout to pelvics 93 mm.; pelvics to vent 40 mm.; vent to caudal 71 mm.

5. IDIACANTHUS ANTROSTOMUS, Gilbert, 1890.

Proc. U. S. Nat. Mus., XIII, p. 54.

Length of head 12 in length of fish. Barbel $1^1/_3$ length of head. Dorsal 57, beginning well in advance of pelvics. Anal 35. Pelvics twice as distant from tip of snout as from vent.

Off California.

Length of type 114 mm.

POST-LARVAL EXAMPLES OF IDIACANTHUS

The post-larval specimens of *I. fasciola* and *I. panamensis*, 33 to 54 mm. in length to base of caudal, have no barbel, no teeth, and no pelvic fins; the end of the gut projects and is supported by a pair of skeletal structures that may be the enlarged spines of the first anal ray. We regard as the most juvenile specimen one of *I. fasciola* 37 mm. in length, from Station 1358, with 300 metres of wire out (fig. 128, A). The skin is pale and through it can be seen a series of pigment spots above and alternating with the lateral photophores; the postocular luminous organ is shorter than the diameter of the eye, which is a little more than $^1/_5$ the length of the head; there are no teeth; larval pectoral fins are present; the dorsal fin contains about 45 rays, and in front of the rayed part, which measures about $^1/_3$ the length of the fish, is a translucent fin-fold, the posterior part of which is raised into a striated lobe resembling an adipose fin. The anal fin has about 32 rays and is about $^1/_4$ the length of the fish.

29 more advanced post-larval specimens of *I. fasciola*, 33 to 44 mm. in length, taken with 2000 to 5000 metres of wire out, have a larger eye, sometimes $^1/_3$ the length of the head, and a larger post-ocular luminous organ, up to $^1/_2$ the length of head. Within the series the skin becomes pigmented, the

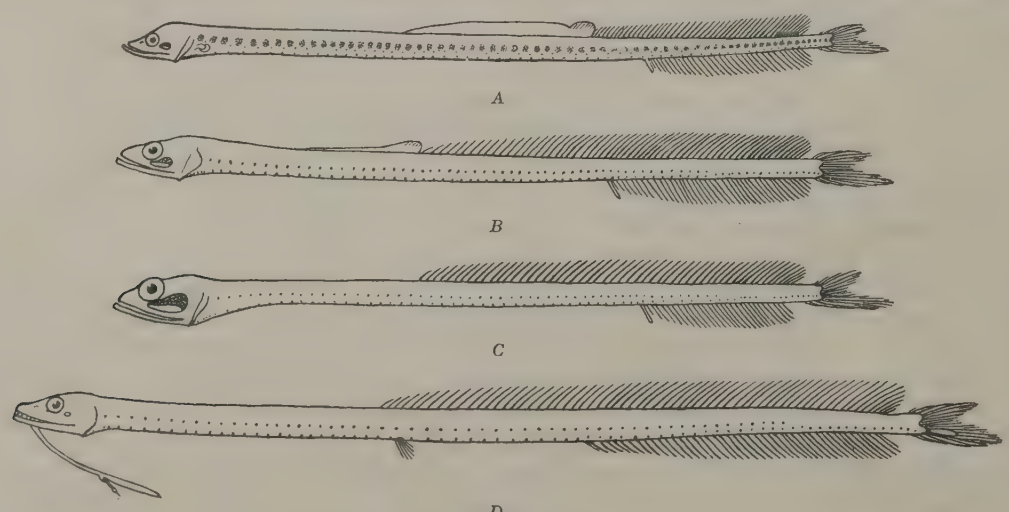


Fig. 128. *Idiacanthus fasciola*. *A*. *B*. and *C*. each 37 mm. long; *D*. 48 mm.

pectoral fins are lost, the dorsal and anal fins become longer and acquire the full number of rays and the rayless fold in front of the dorsal disappears (fig. 128, B, C).

All these post-larval examples are sharply separated from a young fish of 48 mm. in which the barbel is developed, teeth and pelvic fins are present, the end of the gut does not protrude, the eye is smaller, the postocular organ is much smaller, and an oblong body is present in the caudal fin (fig. 128, D).

From these specimens and the data available concerning them we infer that the early post-larval fish live not far below the surface, that a little later they migrate to greater depths, 1000 metres or more below the surface, that the temporary increase in size of the eye and of the postocular luminous organ

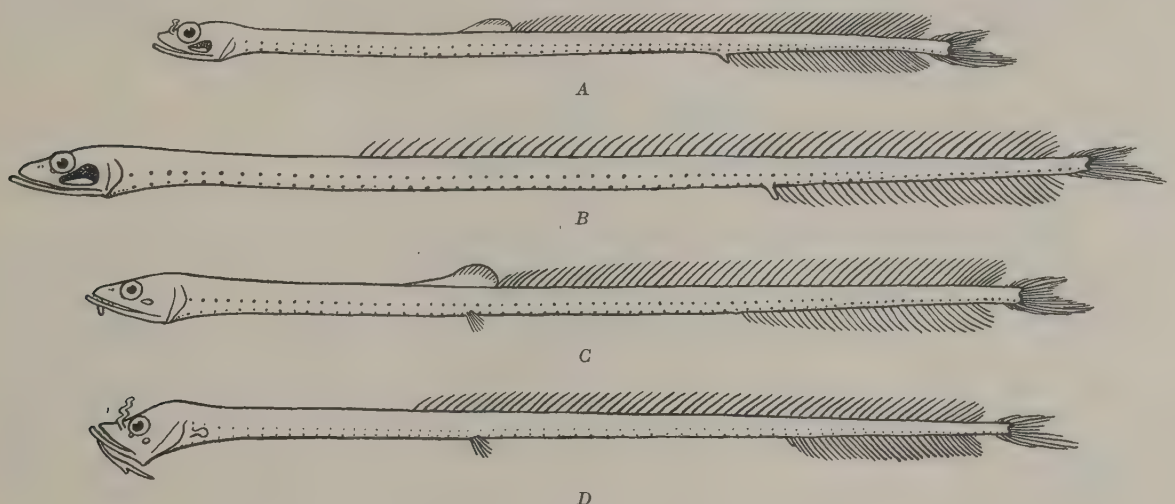


Fig. 129. *Idiacanthus panamensis*. *A*. 40 mm. *B*. 54 mm. *C*. 47 mm. *D*. 48 mm.

is an adaptation to life in the depths, and that the development of the barbel, the pelvic fins, etc. is accompanied by a decrease in the size of the eye and of the postocular luminous organ, not merely a relative decrease but a true reduction. The young fish may perhaps ascend to lesser depths.

The 19 post-larval examples of *I. panamensis*, all taken in the Gulf of Panama with 2000 to 4000 metres of wire out, measure 37 to 54 mm. in length to base of caudal. They have a large eye and a large postocular luminous organ; the protruding end of the gut and its skeletal supports are shorter than in *I. fasciola*, and in the specimens with a series of pigment spots these are fainter than in the Atlantic species. One specimen of 40 mm. (fig. 129, A) appears to have a nasal tube, and a similar structure is present in a curious young fish of 48 mm. (fig. 129, D) with barbel, pelvic fins and rudimentary teeth, but with pectoral lobes retained. A specimen of 54 mm. with post-larval characters (fig. 129, B) is of interest for comparison with a young fish of 47 mm. (fig. 129, C) with the stump of a barbel (probably broken), small postocular organ, rudimentary teeth, pelvic fins present and gut not protruding, but with an "adipose" fin above the pelvics and the anterior dorsal rays close together. The material of *I. panamensis* is thus of interest in including some transitional forms, i. e. young fish retaining certain post-larval features.

Family MALACOSTEIDAE

This family includes fishes that differ from the Stomiatidae in that the head is vertically movable, the mouth is wide and the suspensorium is very oblique, there is no membrane between the lower jaw and the hyoid arch, and the muscles connecting the symphysis of the lower jaw with the hyoid are very ex-

tensible, and are enclosed in a common fibrous sheath to form a slender cord. These muscles diverge posteriorly and appear to be attached to the hypophyals, but they continue under the skin to the upper ends of the cerato-hyals. The anatomy of the Malacosteidae is described on p. 50.

Synopsis of the Genera.

I. A small luminous organ below anterior part of eye in males only. No pectoral fins. No barbel. ..... 1. *Photostomias.*

II. A large subocular luminous organ. Pectoral fins present.

A barbel ..... 2. *Aristostomias.*

No barbel ..... 3. *Malacosteus.*

1. **PHOTOSTOMIAS,** Collett, 1889.

Bull. Soc. Zool. France, XIV. p. 291.

Thaumastomias, Alcock, Ann. Mag. Nat. Hist. (6) VI, p. 220.

Fangs fixed, slender, curved, pointed; about 10 in praemaxillary of which the second may be enlarged; two long pairs anteriorly in lower jaw, followed on each side by a series (up to 25) of smaller teeth of uneven sizes; maxillary with a series (up to 30) of small oblique teeth. Vomer toothless; a series of small teeth on each palatine, increasing in size backwards; 5 to 7 pairs of teeth in three groups on basibranchials; teeth on gill-arches fairly small. Snout short. No barbel. A post-ocular luminous organ and, in adult males, a rounded sub-ocular organ, probably roseous when fresh, below anterior margin of eye. Serial photophores approximately equidistant, except two sub-contiguous organs on each side at the end of the series on the isthmus; a series on the branchiostegal membrane. Dorsal and anal fins sub-equal, with thin colourless fin-membranes. Pectorals absent. Pelvics 6-rayed, long and slender, reaching middle of anal.

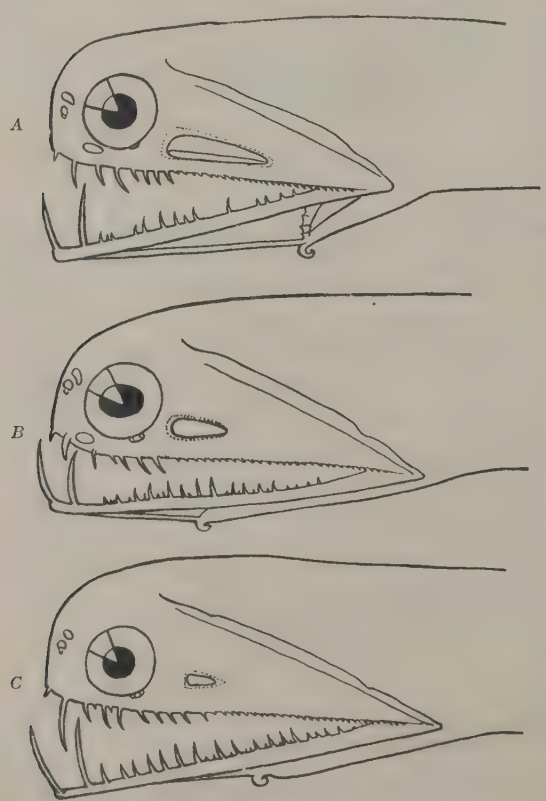


Fig. 130. *Photonectes guernei*; heads (much enlarged). *A, B,* adult males; *C,* adult female.

1. PHOTOSTOMIAS GUERNEI, Collett, 1889. (Pl. XIII, fig. 1).

Bull. Soc. Zool. France XIV, p. 125, and Rés. Camp. Sci. Monaco, X. 1896, p. 131, pl. 1. fig. 5; Lütken, Dansk, Vidensk. Selsk. Skrift. (6) VII, 1892, p. 280, fig.; Zugmayer, Rés. Camp. Sci. Monaco, XXXV, 1911, p. 65, pl. III, fig, 1; Parr, Bull. Bingham Ocean. Coll. III, (2) 1927, p. 102.

Depth of body $7^1/_2$ to 11 in the length, length of lower jaw $4^4/_5$ to 6. Palatine teeth varying in number from 1 or 2 to 6 or 7, when more numerous close-set, in one or two groups increasing in length backwards. Diameter of eye 4 to $7^1/_2$ in length of head; eye smaller in young than in adults, and in females than in males. A small rounded luminous spot below anterior part of eye present in adult males, absent in females and young. Postocular luminous organ from about $^1/_4$ to as long

as or longer than eye, larger in adult males than in females or young, when small oblong, ovate, or triangular, when long acutely pointed behind. Photophores in lateral series O.-V. 13—16; V.-A. 21—24; A.-C. 12—14; in ventral series I.-V. 20—23; V.-A. 22—24. Dorsal 23—28. Anal 26—33. Pelvics 6-rayed, long, reaching anal; base about equidistant from snout or eye and origin of anal fin.

Atlantic; Caribbean Sea.

158 specimens, 25 to 110 mm. in length to base of caudal, from Stations 65, 713, 829, 830, 832, 855, 856, 859, 861, 864, 883, 884, 927, 932, 933, 939, 946, 947, 950, 1019, 1030, 1031, 1043, 1045, 1053, 1058, 1061, 1063, 1064, 1065, 1142, 1148, 1156, 1157, 1158, 1160, 1162, 1165, 1185, 1188, 1189, 1190, 1195, 1218, 1223, 1228, 1230, 1231, 1239, 1242, 1256, 1260, 1261, 1270, 1281, 1294, 1322, 1323, 1330, 1332, 1337, 1342, 1345, 1352, 1353, 1358, 1360, 1365, 1367, 1370, 1374, 1375, 1377 and 1379, with 50 to 5000 metres of wire out.

This is a most puzzling series of specimens, but all may belong to one species. We have ascertained by dissection that the specimens with a praeocular luminous spot are males. The smallest specimen with a distinct spot measures 55 mm.; larger ones without the spot are females. Apart from the difference in size of the eye and postocular luminous organ due to sex and age there may be considerable differences in this respect between specimens of the same size and sex, but we have been unable to correlate these with other differences, e. g. number of fin-rays.

We have counted the fin-rays in 80 specimens. The dorsal fin has 23 rays in 4, 24 in 18, 25 in 17, 26 in 20, 27 in 12, and 28 in 9. The anal rays number 26 in one specimen, 27 in 10, 28 in 20, 29 in 20, 30 in 15, 31 in 6, 32 in 6 and 33 in 2.

The following list includes the males with a praeocular luminous spot. Under L. is given the length to base of caudal, in millimetres; under E the size of the eye (times in length of lower jaw); under P the length of the postocular luminous organ (times in lower jaw); under D and A the number of dorsal and anal rays.

		L.	E.	P.	D.	A.
Station	932	55	6 1/2	9	28	32
—	1337	58	6	9	28	30
—	1294	60	5 1/2	9 1/2	26	29
—	927	60	6	8	26	28
—	1223	65	4 1/2	8	25	28
—	1195	70	4 2/3	6 1/3	27	30
—	1195	72	5	7 1/2	25	29
—	1323	72	5 1/3	7	24	27
—	1377	75	5 1/2	6	25	26
—	1195	80	4 1/3	7	26	30
—	61	81	5 1/4	8	24	28
—	1189	83	4 4/5	7 1/3	28	30
—	1256	84	4 1/2	6	26	30
—	1160	85	4	3	25	29
—	1189	86	4 4/5	6 3/4	26	32
—	1195	88	4 4/5	6	26	30
—	1195	90	4 1/4	6	26	28
—	1218	90	4	4	24	27
—	1218	97	4	4 1/2	27	28
—	1379	100	4 1/4	5 1/2	25	29
—	1345	101	4	4	24	28
—	1156	103	4	4	23	27
—	1231	105	4 1/4	4 1/4	26	28

This table shows well the general tendency of the eye and postocular luminous organ to increase in relative length as the fish grows. The most aberrant specimen is the one of 85 mm. from Station 1160, in which the postocular organ is 1/3 the length of the lower jaw; in the absence of other differences we cannot describe it as specifically distinct.

The specimens without a praeocular luminous spot that have been sexed and found to be females are the following:—

	L.	E.	P.	D.	A.
Station 832	50	6	8	26	29
— 1156	50	6 2/3	15	24	30
— 1342	55	6 2/3	7	27	32
— 1185	57	6	10	27	30
— 1185	58	6	12	23	28
— 1281	60	5 1/2	9	26	29
— 1242	60	4 1/2	6 2/3	28	33
— 1223	61	5	18	25	28
— 1030	68	6	13	26	29
— 1195	70	5 1/4	9	27	31
— 1195	73	5	8	28	30
— 1142	73	6	7 1/2	28	33
— 1337	73	5 1/4	15	27	30
— 1367	76	5	7	27	31
— 1165	84	5 1/2	7	23	27
— 1374	85	4 1/2	10	25	28
— 1188	87	5 1/2	11	27	31
— 947	90	5 2/3	10	24	30
— 1223	92	5	10	27	29
— 1230	96	5 1/3	12	26	29
— 1374	96	6	12	24	27
— 1260	97	4 2/3	17	24	28
— 1157	100	6	18	24	27
— 1377	104	5 1/2	13	23	28
— 947	105	5 1/4	10 1/2	25	28
— 1260	110	4 3/4	15	25	28

From this table it appears that both eye and postocular organ are very variable, and that in females there is no marked increase in relative size of the eye after a length of about 60 mm. and none

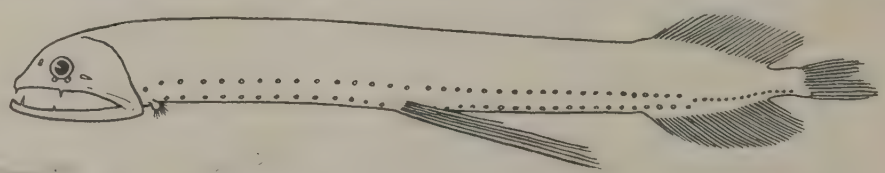


Fig. 131. *Photonectes guernei*; young specimen with pectoral fins (× 5).

in that of the postocular luminous organ. A comparison of females over 80 mm. with males of the same size gives for females, eye 4 1/3 to 6, postocular organ 7 to 18 in length of lower jaw, and for males eye 4 to 5 1/4, postocular organ 3 to 8 in length of lower jaw.

In specimens of 25 to 50 mm., that have not been examined for sex, the diameter of the eye varies from 5 to $7^1/_2$ in the length of the lower jaw.

Seven specimens from Station 1225 (600 M.W.), 25 to 28 mm. in length to base of caudal, differ from other young specimens of this size in having small larval pectoral fins, and are also distinguished by fewer and feebler teeth, and a longer snout (fig. 131). A small photophore below the anterior part of the eye may represent the praeorbital luminous organ of adult males.

2. PHOTOSTOMIAS ATROX, Alcock, 1890.

Thaumastomias atrox, Alcock, Ann. Mag. Nat. Hist. (6) VI, p. 220, pl. VIII, fig. 7.

Photostomias atrox, Alcock, Cat. Indian Deep Sea Fishes, p. 150 and Ill. Zool. Investigator, pl. XXX, fig. 2 (1899).

Depth of body 10 in the length, length of lower jaw 5. A series of 7 or 8 palatine teeth, increasing in length backwards. Diameter of eye 4 in length of head; a small rounded luminous spot below its anterior edge. A very large slipper-shaped postocular luminous organ, its length about $^2/_5$ length of lower jaw. Photophores I.-A. ca. 40; O.-C. ca. 50; (according to the figure O.-V. 13; V.-A. 23; A.-C. 12.). Dorsal 23. Anal 25. Pelvics 6-rayed, long.

Indian Ocean.

Length of type, to base of caudal, 115 mm.

Collett and some subsequent authors have placed this species in the synonymy of *P. guernei*. Some of the "Dana" specimens of *P. guernei* approximate much more closely than any hitherto described to Alcock's type, in the size of the eye and length of the postocular luminous organ; but until more material from the Indian Ocean has been studied *P. atrox* may be maintained as a separate species.

2. ARISTOSTOMIAS, Zugmayer, 1913.

Bull. Inst. Océan., Monaco, no. 253, p. 1.

Zastomias, Gilbert. Proc. U. S. Nat. Mus., XLVIII, 1915, p. 322.

Cleft of mouth straight. Fangs fixed, curved, strongly barbed; praemaxillaries with 6 or 7 fangs on each side, not enlarged; lower jaw with two pairs of long anterior fangs, fitting into grooves on the snout, followed on each side by 5 to 9 smaller fangs. Vomer toothless; a long series (up to 12) of teeth on each palatine; 1 to 3 pairs of teeth on the first basibranchial, 2 to 4 pairs on the second, none on the gill-arches. A crescentic subocular luminous organ close to the lower anterior border of the orbit; above its posterior end the small "doppelorgan", and behind it the post-ocular luminous organ. Barbel slender, usually ending in a small swelling. Serial photophores showing a tendency to form small linear or clustered groups; three pairs in front of pectorals always lying between right and left members of the two preceding pairs. Dorsal and anal beginning at same vertical, their bases fleshy, and the rays partly covered by the thick black membrane. Paired fins small; pectoral of 6 to 17 fine rays; pelvics 6-rayed, in or behind middle of length.

Synopsis of the Species.

I. Series of ventral photophores more or less divided by gaps, but without groups of close-set photophores. Pectoral of 4 to 8 rays.

Lateral series O.-V. without a group of close-set photophores. Barbel of adult without distinct bulb. A curved strip of luminous tissue in front of and below eye and subocular organ ..... 1. *lunifer*.

Lateral series O.-V. with a group of close-set photophores posteriorly. Barbel with ovate or club-shaped bulb. ..... 2. *scintillans*.

II. Series of ventral photophores P.-V. divided into linear or clustered groups of close-set photophores. O.-V. series similar except first 3 or 4 photophores, which are spaced.

A. Pectoral of 6 to 10 rays; postocular luminous organ much shorter than eye.

O.-V. 14—18. Postocular organ 1/4 eye or less. No series of luminous dots on head. Barbel with small bulb which is broader proximally. 3. *xenostoma.*

O.-V. 18—20. Postocular organ 1/2 to 2/3 eye. A series of luminous dots running backwards from between subocular and postocular organs. Barbel with conspicuous oval or club-shaped bulb .... 4. *tittmanni.*

O.-V. 16. Postocular organ 1/4 to 3/5 eye. A series of luminous dots as in *A. tittmanni.* Barbel with long slightly thickened terminal part. 5. *grimaldii.*

B. Pectoral of 14 to 17 rays; postocular luminous organ about as long as eye ..... 6. *polydactylus.*

1. ARISTOSTOMIAS LUNIFER, sp. n. (Pl. XIII, fig. 2).

? *Aristostomias scintillans* (*non* Gilbert, *part.*) Parr, Bull. Bingham Ocean. Coll. III (2), 1927, p. 96, fig. 54.

Depth 6 1/2 to 7 in the length, length of lower jaw 4 (young) to 4 2/3. Length of snout about 3 1/2, diameter of eye 5 to 5 1/2 in length of lower jaw. Subocular luminous organ 1/2 to 2/3 diameter of eye, postocular organ 1/3 to 1/2. A semicircular strip of luminous tissue in front of and below eye and subocular organ. Barbel 1/3 (young) to 3/5 length of fish; end luminous but hardly enlarged. Dorsal 20—24. Anal 26—29. Pectoral 7—8. Pelvics 6-rayed, equidistant from end of snout and base of caudal, or nearer caudal. Photophores in ventral series I.-P. 5 + 3; P.-V. 17—18, divided into groups by gaps after

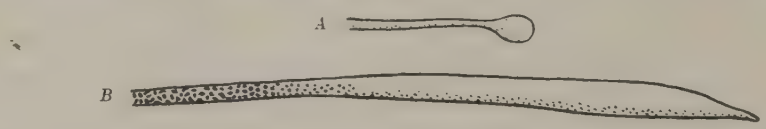


Fig. 132. *Aristostomias lunifer.* End of barbel of *A.* young (28 mm.) and *B.* adult (93 mm.) (both × 30).

the 6th, 9th or 10th and sometimes the 13th or 14th but none of the groups with photophores close-set; V.-A. 13—14, gaps after the 3rd and 7th. A.-C. 10—11, the last 3 or 4 forming a close group. In lateral series O.-V. 18—19, sometimes a gap after the fourth; no close-set groups, but last two sometimes closer together than the rest; V.-A. 16—18, the last 4 to 7 forming a close group.

Western Atlantic; Caribbean Sea.

Three specimens, 28, 40 and 93 mm. in length to base of caudal, respectively from Stations 1195, (600 M.W.), 1352 (300 M.W.), and 1291 (1000 M.W.).

A specimen of 28 mm. from Station 1320 (800 M.W.) is extremely similar to the one of the same size from Station 1195, except that the barbel is less than 1/5 the length of the fish, and ends in a well-developed ovate bulb (cf. *A. xenostoma*).

2. ARISTOSTOMIAS SCINTILLANS, Gilbert, 1915.

Zastomias scintillans, Gilbert, Proc. U. S. Nat. Mus. XLVIII, p. 322, pl. XV, fig. 4.

? *Aristostomias scintillans,* (*part.*) Parr, Bull. Bingham Ocean. Coll. III, (2), 1927, p. 96, fig. 11.

Depth 6 in the length, length of the lower jaw 4. Diameter of eye 5 in length of lower jaw. Subocular luminous organ somewhat shorter than diameter of eye; postocular organ oval, about 1/2 diameter of eye. Barbel 3/5 length of fish, ending in a club-shaped bulb. Dorsal 21. Anal 27. Pectoral 4—5? Pel-

vics 6-rayed, nearer to base of caudal than to postocular luminous organ. Photophores uncertain, but lateral series with some close-set groups, including one formed by the last 5 of the O.-V.-series.

Monterey Bay, California.

The type measures 72 mm. in length to base of caudal.

Parr refers to this species two specimens from the Western Atlantic, one of which, 125 mm. in length, appears to agree with it and to differ from our *A. lunifer* in having a group of 5 close-set photophores at the posterior end of the O.-V. series. In this specimen the barbel is $^2/_5$ the length, and ends in a small bulb. The second specimen, 135 mm. in length, has the barbel incomplete, and presumably is the one in which the group of photophores at the end of the O.-V. series numbers only 2? This may be our *A. lunifer*. Parr's description of the subocular organ as situated on the eye suggests that his specimens had a curved strip of luminous tissue in front of and below the eye and subocular organ, as in *A. lunifer*, in which species the luminous strip at first sight appears to border the orbit; no such structure was described or figured by Gilbert. It must therefore remain doubtful whether Parr's first specimen belongs to *A. scintillans* and the second to *A. lunifer*, or whether they are of a species distinct from both.

3. ARISTOSTOMIAS XENOSTOMA, sp. n. (Pl. XIII, fig. 3).

Depth $4^2/_3$ to $5^1/_3$ in the length, length of lower jaw $3^1/_3$ to 4. Length of snout $3^1/_2$ to 4, diameter of eye $3^2/_3$ to $4^2/_5$ in length of lower jaw. Subocular luminous organ a little shorter, than eye and 4 to 7 times as long as postocular organ; sometimes a few bluish spots below subocular organ. Barbel $^1/_3$ to more than $^1/_2$ length of fish, ending in a small white bulb which is broader proximally. Dorsal 21—23.

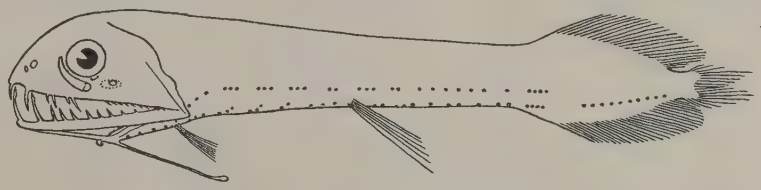


Fig. 133. *Aristostomias xenostoma*; young fish 34 mm. long (× 3).

Anal 26—29. Pectoral 6—9, usually 7. Pelvics 6-rayed, equidistant from some part of eye and base of caudal. Photophores in ventral series I.-P. 5 + 3; P.-V. 14—17, in five or six groups of 2 to 4 close-set photophores; V.-A. 15—18, in similar groups; A.-C. 9—11; in lateral series O.-V. 14—18, the first 3 or 4 rising obliquely, the rest in groups of 2 to 4; V.-A. 14—16, in groups, except sometimes 3 to 6 spaced photophores in the middle of the series.

Atlantic; Caribbean Sea.

Eleven specimens, 40 to 112 mm. in length to base of caudal, from Stations 1162, 1163, 1166, 1171, 1178, 1181, 1183, 1184, 1280, and 1285, with 300 to 4000 metres of wire out.

Young specimens, 27 to 36 mm. in length, have the following characters in common:— Depth 5 to 6 in length, lower jaw $3^3/_4$ to $4^1/_2$. Snout $2^2/_3$ to 3, eye $3^1/_2$ to 4 in lower jaw. Subocular organ nearly

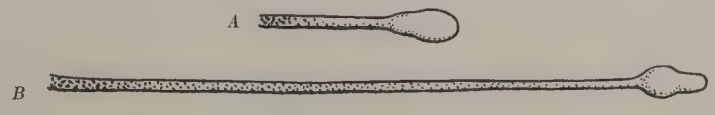


Fig. 134. *Aristostomias xenostoma*; end of barbel of *A* young (31 mm.) and *B* adult (75 mm.) (both × 25).

as long as eye, 5 to 8 times postocular organ. Barbel $^1/_{10}$ to $^1/_4$ length of fish; bulb rather large, broader distally. Dorsal 21—23. Anal 26—29. Pectoral 7—8. Pelvics 6-rayed, equidistant from snout or eye and

caudal. Photophores I.-P. 5 + 3; P.-V. 14—15; V.-A. 15—17; A.-C. 9—11; O.-V. 15—19; V.-A. 14—16; all arranged as in adults, but 4 to 9 spaced photophores in middle of lateral V.-A. series.

These specimens, six in number, are from Stations 1162, 1171, 1183, 1228, 1269, and 1285, with 100—2000 metres of wire out. Their most important difference from the adults is in the size and shape of the bulb of the barbel, but in view of the correspondence in other characters we consider that they belong to the same species. Probably the distal part of the bulb becomes reduced when the fish attains a length of about 40 mm. The stomach is shorter than in adult specimens.

We also refer to this species three specimens with incomplete barbels, 22 to 34 mm. long, from Stations 1171 and 1181, with 1000 to 3000 metres of wire out.

4. ARISTOSTOMIAS TITTMANNI, Welsh, 1923.

Aristostomias tittmanni, Welsh, Proc. U. S. Nat. Mus. LXII, (3), p. 3, fig. 2.

Depth 5 to $6^1/_2$ in the length, length of lower jaw $3^1/_2$ to $4^2/_5$. Length of snout 3 to $3^1/_2$, diameter of eye 5 to 6 in length of lower jaw. Subocular luminous organ $^2/_5$ to $^4/_5$, postocular organ $^1/_2$ to

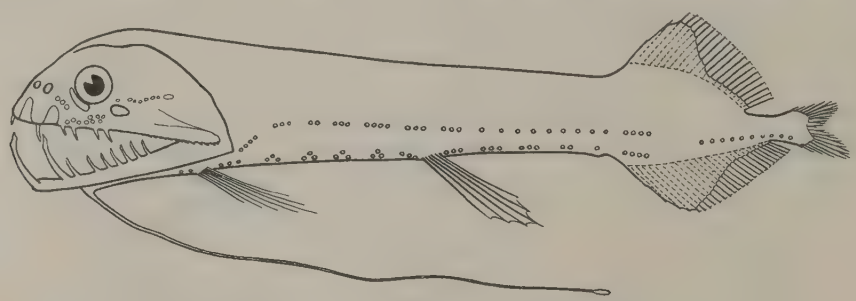


Fig. 135. *Aristostomias tittmanni* ($\times 2^2/_5$).

$^3/_5$ diameter of eye. A series of bluish spots running backwards from between subocular and postocular organs; a group of similar spots below and in front of eye. Barbel $^3/_5$ to $^3/_4$ length of fish, with con-

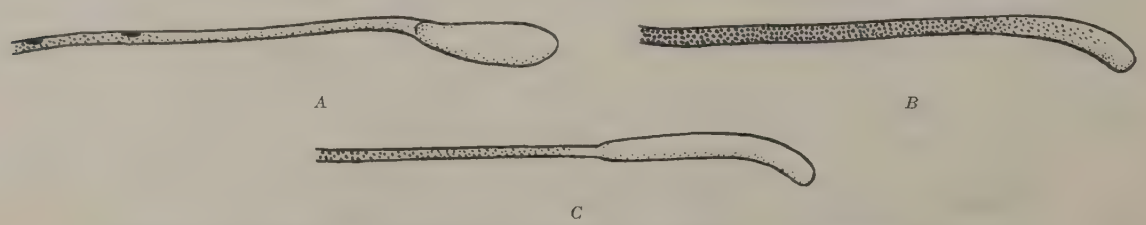


Fig. 136. End of barbel of *A. Aristostomias tittmanni; B. A. grimaldii; C. A. polydactylus.* (all × 15).

spicuous club-shaped bulb. Dorsal 20—22. Anal (24) 26—29. Pectoral 6—7. Pelvics 6-rayed, equidistant from some part of eye and base of caudal. Ventral photophores I.-P. 5 + 3; P.-V. 15—19, in groups of 2 to 4 close-set photophores, some clustered; V.-A. 14—16, in groups, or with 2 to 8 in the middle spaced; A.-C. 9—11; lateral O.-V. 18—20, the first four ascending obliquely, the rest in close groups of 2 to 4; V.-A. 14—16, a close-set series of 3 to 5 at each end, the rest spaced.

Atlantic; Caribbean Sea; Gulf of Mexico.

Nine specimens, 40 to 88 mm. in length to base of caudal, from Stations 881, 1020, 1171, 1183, 1225, 1345, 1353, and 1378, with 40 to 2000 metres of wire out.

5. ARISTOSTOMIAS GRIMALDII, Zugmayer, 1913. (Pl. XIV, fig. 2).

Bull. Inst. Océan. Monaco, 253, p. 1.

Depth $4^2/_3$ to 6 in the length, length of lower jaw $3^2/_5$ to 4. Snout $3^2/_5$ to $4^1/_2$, diameter of eye 5 to 6 in length of lower jaw. Subocular luminous organ $^2/_3$ to nearly as long as eye, postocular organ $^1/_4$ to $^3/_5$ diameter of eye. A series of small bluish luminous spots running backward from between subocular and postocular organs; a group of similar spots below subocular organ, and sometimes in front of eye. Barbel $^1/_3$ to $^3/_5$ length of fish, ending in a slight but elongate swelling, often curved, probably luminous only at distal end. Dorsal 21—26. Anal 27—32. Pectoral 7—10. Pelvics 6-rayed, equidistant from snout or anterior edge of eye and base of caudal. Ventral photophores I.-P. 5 + 3; P.-V. 14—16, in 5 close groups of 2 to 4, some clustered; V.-A. 15—17, in close lineàr groups of 1 to 4, or 3 to 7 in the middle spaced; A.-C. 10—11; lateral, O.-V. 16, the first four oblique, the rest in 4 close linear groups of 2 to 4; V.-A. 15—16, one or two close groups of 3 to 4 at the beginning, and generally one at the end, the rest spaced.

Atlantic; Caribbean.

Eight specimens, 35 to 117 mm. in length to base of caudal, from Stations 882, 1174, 1230, 1273, 1281, 1314 and 1353, with 50 to 1500 metres of wire out. We have examined the type, 85 mm. in length to base of caudal. A young fish 35 mm. from Station 1161 (M.W. 600) has the barbel incomplete; it may belong to this species, with which it agrees in number of fin-rays (D. 21; A. 27; P. 10; Pv. 6) and photophores, but is younger than the two other 35 mm. specimens, having the body only lightly pigmented, no luminous tissue on the head, lower jaw a little more than $^1/_5$ of the length, caecal stomach very short and anterior half of the intestine broad.

6. ARISTOSTOMIAS POLYDACTYLUS, sp. n. (Pl. XIV, fig. 3).

Depth 5 to 7 in the length, length of lower jaw 3 to $3^3/_4$. Length of snout 3 to $3^3/_4$, diameter of eye 5 to 7 in length of lower jaw. Subocular luminous organ $^1/_2$ to $^2/_3$ diameter of eye, postocular organ about as long as eye. Numerous small greenish luminous spots below and in front of eye, a dense

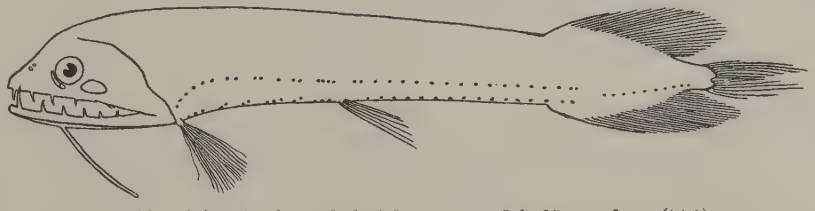


Fig. 137. *Aristostomias polydactylus*; young fish 35 mm. long (× 3).

streak between subocular and postocular organs, and a trail of spots backwards. Barbel $^2/_5$ (young) to nearly $^3/_4$ length of fish, ending in a narrow elongate bulb. Dorsal 21—26. Anal 26—29. Pectoral 14—17. Pelvics 6-rayed, equidistant from some part of snout and base of caudal. Ventral photophores I.-P. 5 + 3; P.-V. 15—17, in six or seven groups of 1 to 4; V.-A. 15—18, all spaced, or the first 2 or 3, or the first and last 3 in a close group; lateral, O.-V. 15—17, the first 3 or 4 ascending obliquely, these and the next 2 to 5 spaced, the rest in close linear groups of 2 to 4; V.-A. 17—18, the first 3 or 4 close, the rest spaced, except sometimes the last 2 or 3.

Atlantic; Caribbean Sea.

Eleven specimens, one 60 mm. in length to base of caudal from Station 927 with 50 metres of wire out, the others 31 to 35 mm., from Stations 927, 928, 1189, 1190, 1194, 1217, 1223, 1228 and 1239, with 50 to 2000 metres of wire out.

A specimen of 35 mm. (fig. 137) from Station 1217 (2000 M.W.) agrees with this species in numerical characters, but has the same juvenile characters of pigmentation, gut, lower jaw, etc. as the young one referred to *A. grimaldii*. The barbel is complete, but is only $^1/_7$ the length of the fish.

3. **MALACOSTEUS,** Ayres, 1857.

Boston Journ. Nat. Hist. VI, p. 53.

Praemaxillary teeth small, fixed; maxillary with minute oblique teeth or none; lower jaw with four or five enlarged, fixed fangs, barbed at the tips, and smaller fixed teeth between and behind these. Vomer and palatines toothless; 10 to 12 pairs of teeth in four groups on basibranchials; teeth on gill-arches rudimentary or absent. Snout very short. No barbel. A large sub-ocular luminous organ below the eye, pointed anteriorly; a small "doppelorgan" above its posterior end, and a post-ocular luminous organ well behind the eye. No photophores on branchiostegal membrane, and no serial photophores on body. Dorsal and anal begining at same vertical, with deep muscular bases, and thick blackish fin-membranes. Pectorals small, of 3 to 5 rays. Pelvics 6-rayed, behind middle of length.

1. MALACOSTEUS NIGER, Ayres, 1857.

Boston Journ. Nat. Hist. VI, p. 53, pl. V; Goode and Bean, Oceanic Ichth. p. 114, fig. 183 (1895); Zugmayer, Rès. Camp. Sci. Monaco, XXXV, 1911, p. 68, pl. III, fig. 2; Parr, Bull. Bingham Ocean. Coll., III (2) 1927, p. 99.

Malacosteus choristodactylus, Vaillant, "Travailleur" et "Talisman" Poiss. p. 108, pl. VIII, fig. 4 (1888); Goode and Bean, t. c. p. 114, fig. 139.

Malacosteus sp., Alcock, Cat. Ind. Deep-Sea Fish, p. 149, and Ill. Zool. "Investigator", pl. XXXIII, fig. 4 (1899).

Malacosteus indicus, Brauer "Valdivia" Tiefseefische, p. 65, pl. IV, fig. 1, (1906).

Depth of body $5^1/_2$ to $7^1/_2$ in the length, length of lower jaw $3^4/_5$ to 4. Diameter of eye about 4 in length of lower jaw. Subocular luminous patch more than twice as long as deep. Postocular luminous organ small, but in specimens of 110 mm. or over more than $^1/_4$ diameter of eye. Dorsal 18—20. Anal 19—23. Pectoral of 3 to 5 rays. Pelvics 6-rayed, equidistant from eye and base of caudal, or a little nearer caudal.

Atlantic; Indian Ocean.

Here desribed from six specimens, 75 to 145 mm. in length to base of caudal, from stations 1152, 1171, 1269, 1283 and 1342, with 2000 to 7000 metres of wire out. Eight specimens, 24 to 70 mm. in

Fig. 138. *Malacosteus niger.*

length, from stations 91, 1171, 1183, 1189, 1283, 1342 and 1358 (1600 to 4000 M.W.) also belong to this species.

The numbers of fin-rays given above are those found in these specimens; some authors have counted as few as 15 in the dorsal and anal.

2. MALACOSTEUS DANAE, sp. n. (Pl. XIV, fig. 1).

Depth of body 7 in the length, length of lower jaw $3^2/_5$ to $3^2/_3$. Diameter of eye 5 in length of lower jaw. Subocular luminous patch as long as eye, more than twice as long as deep. Postocular luminous organ smaller than in *M. niger* and *M. indicus*, its length less than $^1/_4$ diameter of eye. Dorsal 19—21. Anal 20—22. Pectoral of 3 or 4 rays. Pelvics 6-rayed, nearly equidistant from eye and base of caudal.

Gulf of Panama.

Two specimens, 130 and 146 mm. in length to base of caudal, from Stations 1203 and 1209, with 3500 metres of wire out.

This species resembles *M. indicus* in the long lower jaw, but differs in the narrower subocular patch and smaller postocular organ.

3. MALACOSTEUS INDICUS, Günther, 1878.

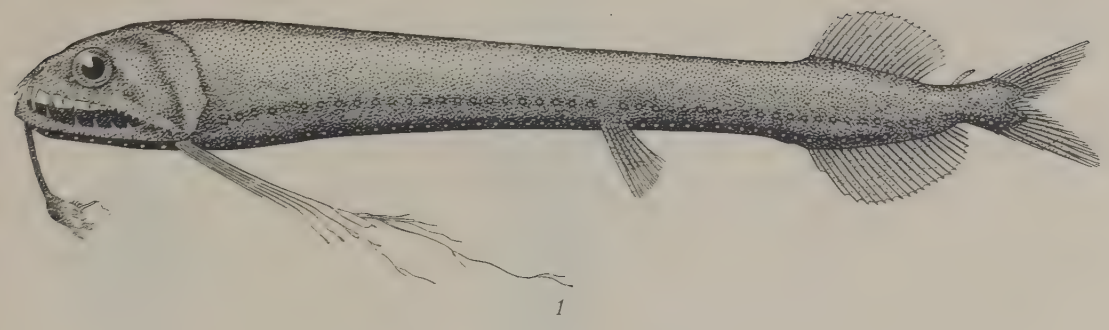
Challenger Deep Sea Fishes, p. 214, pl. LIV, fig. 3 (1887).

Depth of body $7^1/_2$ in the length, length of lower jaw $3^1/_2$. Diameter of eye 5 in length of lower jaw. Depth of subocular luminous patch $^1/_2$ diameter of eye. Postocular luminous organ more than $^1/_4$ diameter of eye. Dorsal 20. Anal 20. Pectoral of 3 rays. Pelvics 6-rayed, considerably nearer to base of caudal than to eye.

Philippine Islands.

The type measures 106 mm. to case of caudal.

The specimens from the Indian Ocean figured by Alcock and by Brauer are not of this species; they have the lower jaw $^1/_4$ the length of the fish.



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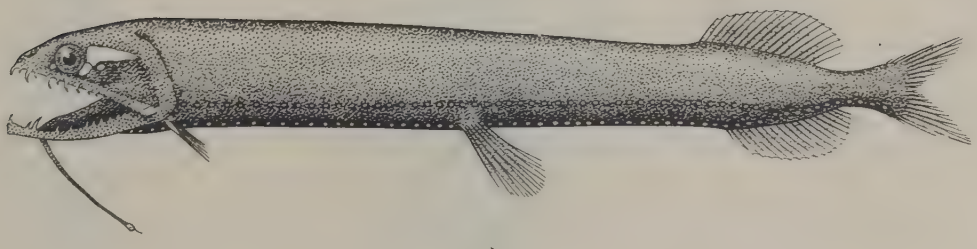

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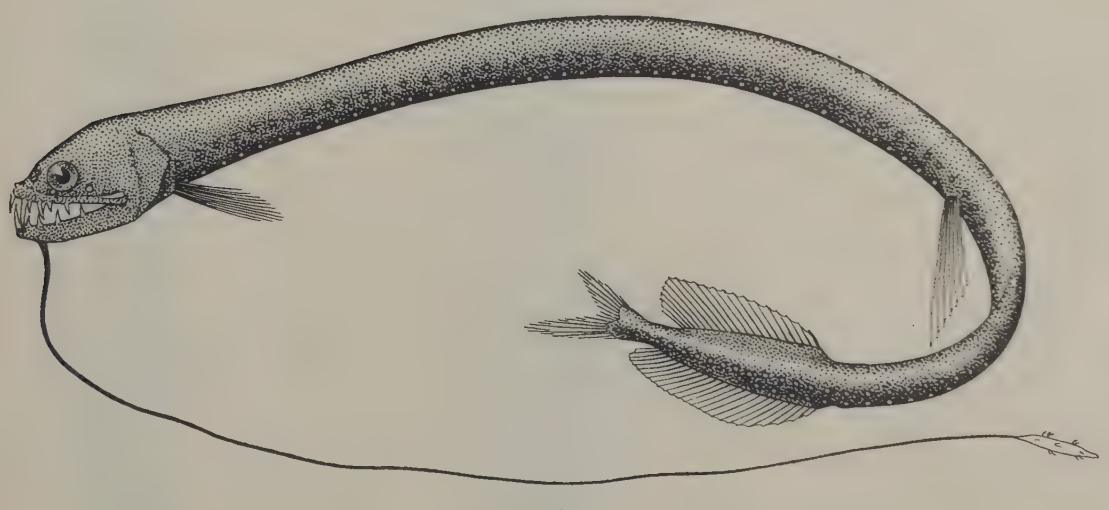

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Fig. 1. *Chirostomias pliopterus* (× 1 1/3). Fig. 2. *Trigonolampa miriceps* (× 1 1/3).
Fig. 3. *Leptostomias longibarba* (× 2).

Fig. 1. *Thysanactis dentex* (× 1⅓). Fig. 2. *Flagellostomias bourreei.*

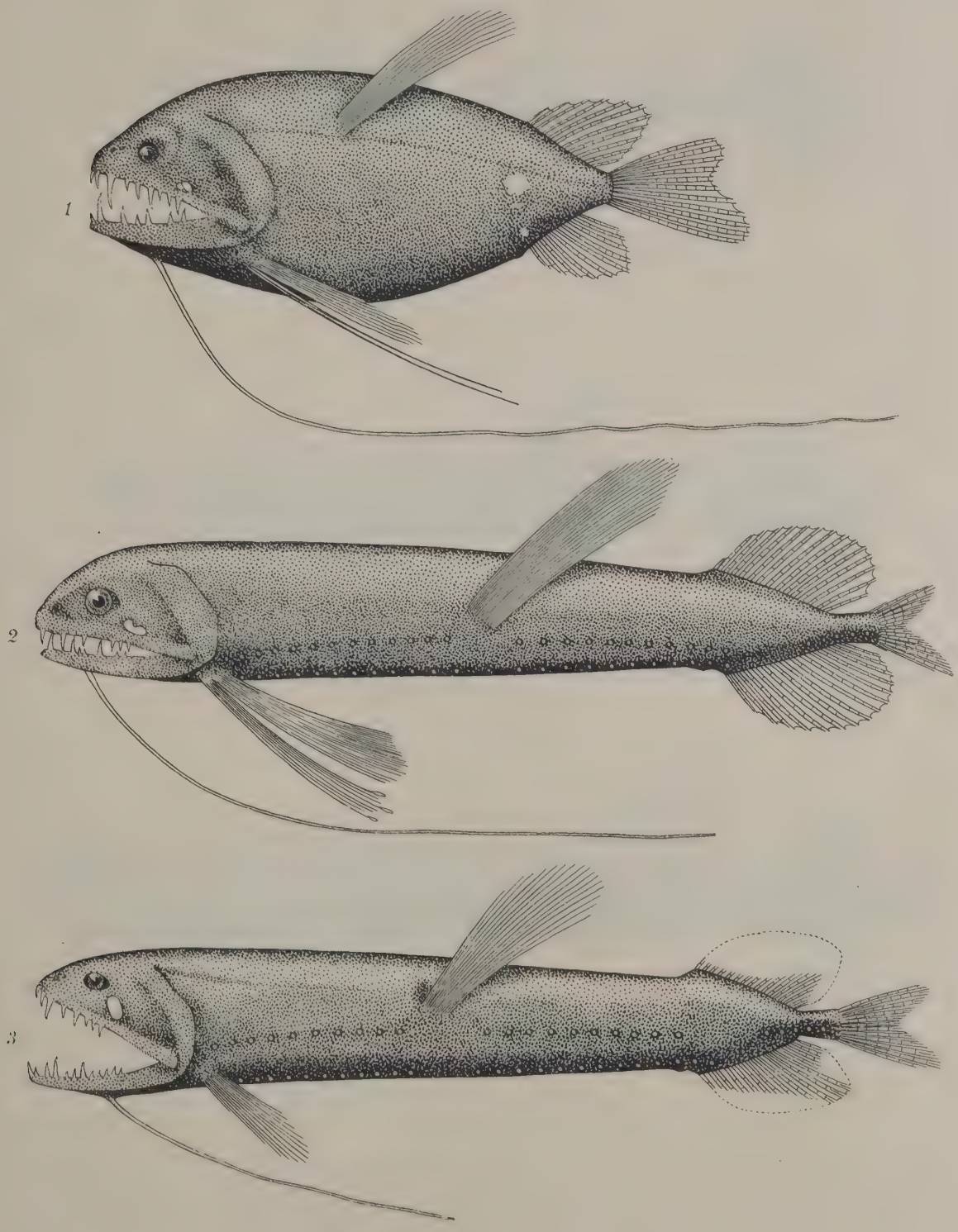
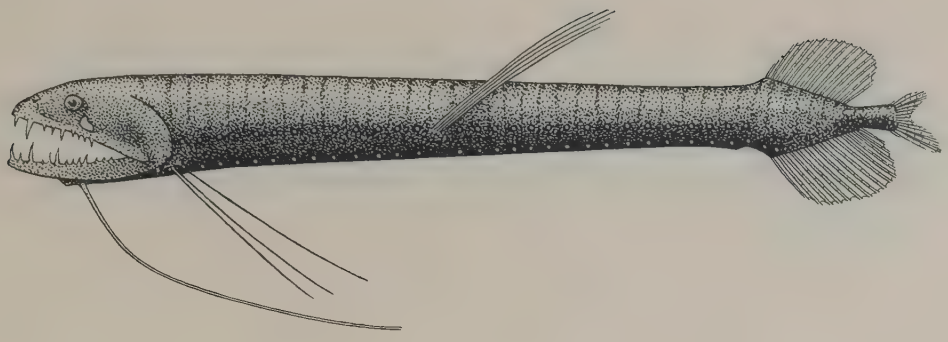


Fig. 1. *Bathophilus brevis* (× 2). Fig. 2. *Bathophilus nigerrimus* (× 2⅔). Fig. 3. *Bathophilus proximus* (× 2⅔).



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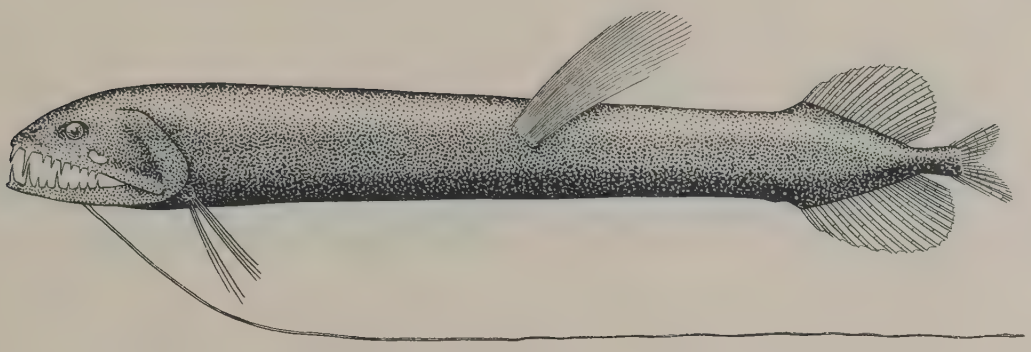

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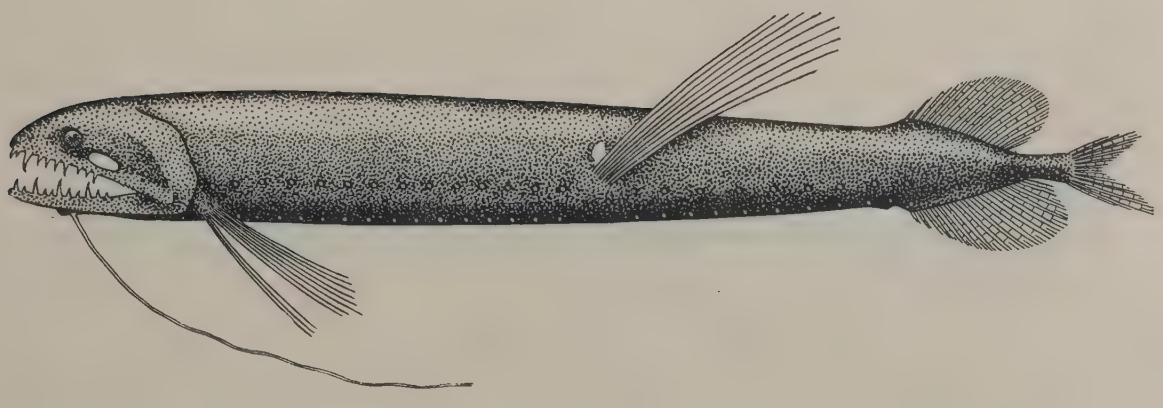

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Fig. 1. *Bathophilus metallicus* (× 1⅓). Fig. 2. *Bathophilus schizochirus* (× 2).
Fig. 3. *Bathophilus longipes* (× 2).

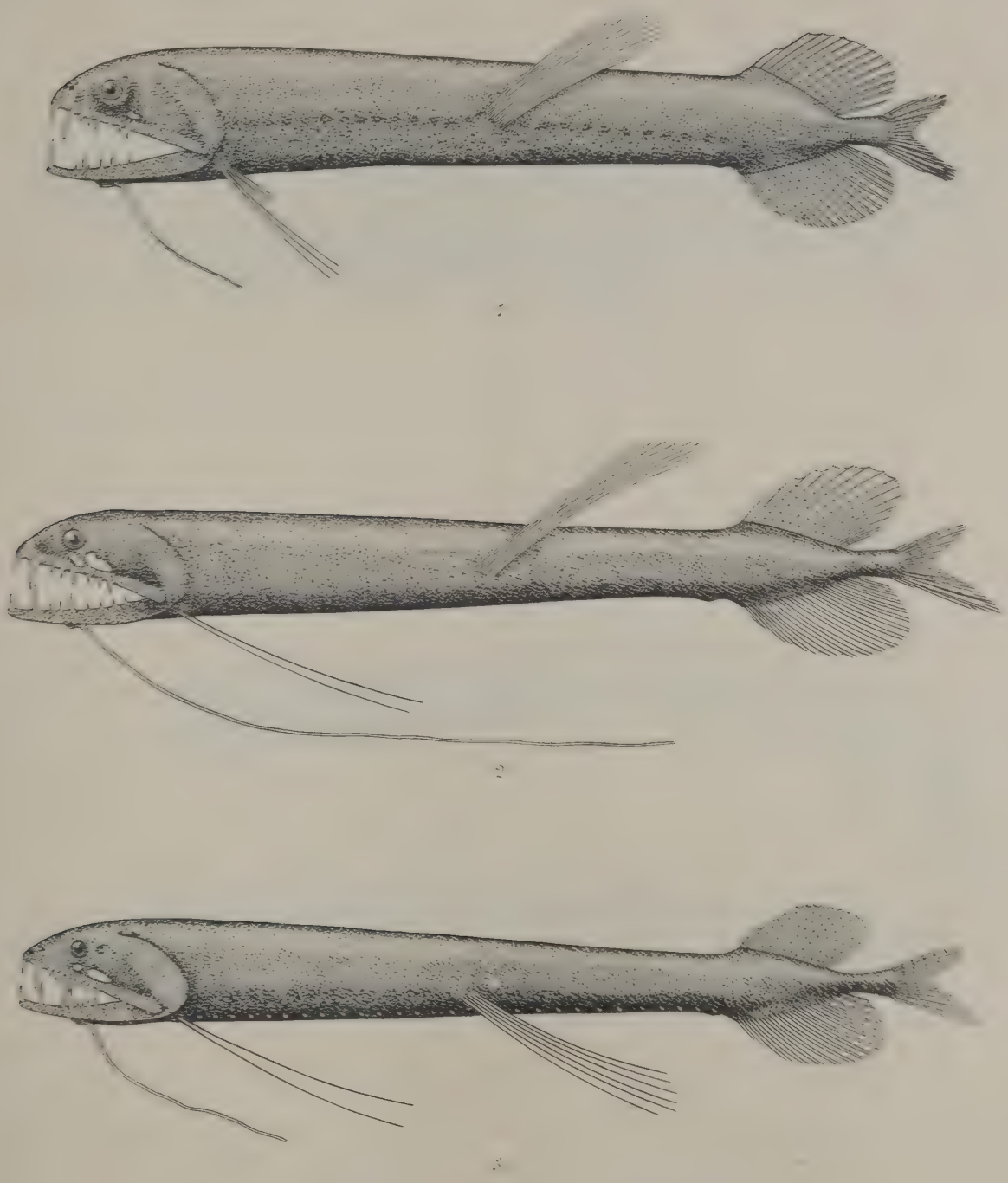
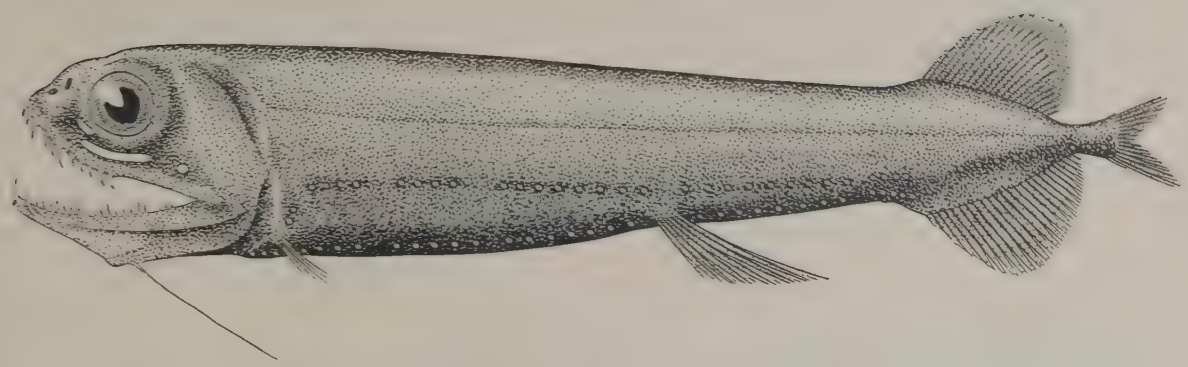


Fig. 1. *Bathophilus longipinnis* (× 2). Fig. 2. *Bathophilus nedus* (× 4⅔ s).
Fig. 3. *Bathophilus chironema* (× 3¹ s).



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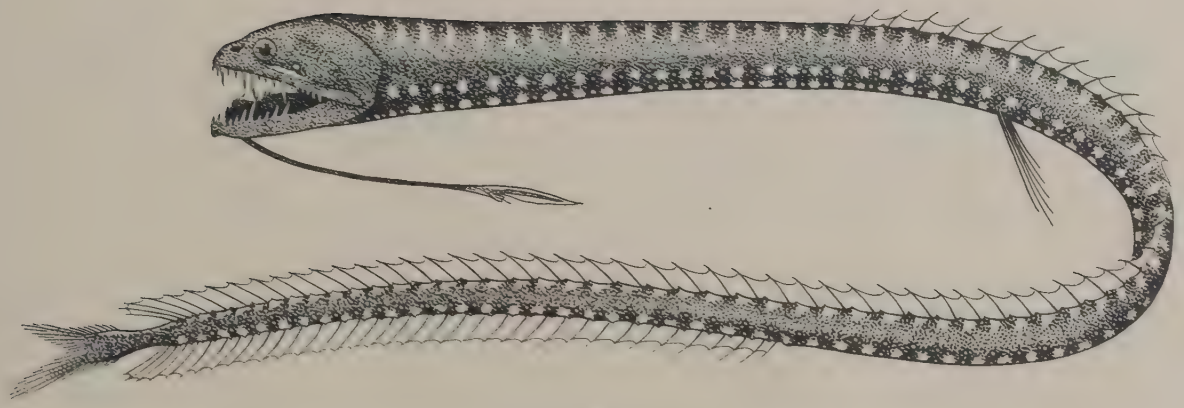

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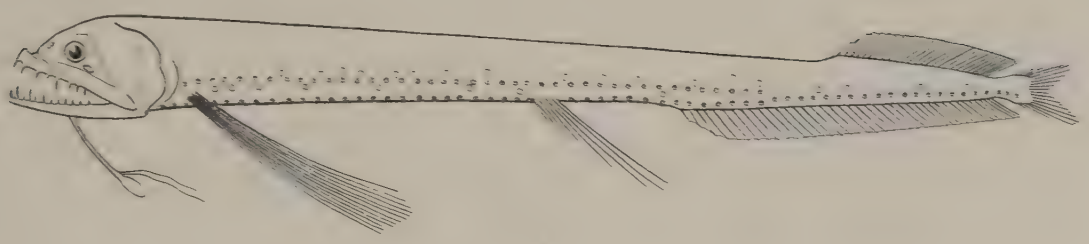
Fig. 1. *Pachystomias atlanticus.*

Fig. 2. *Idiacanthus panamensis* ($\times 1^1/_3$).



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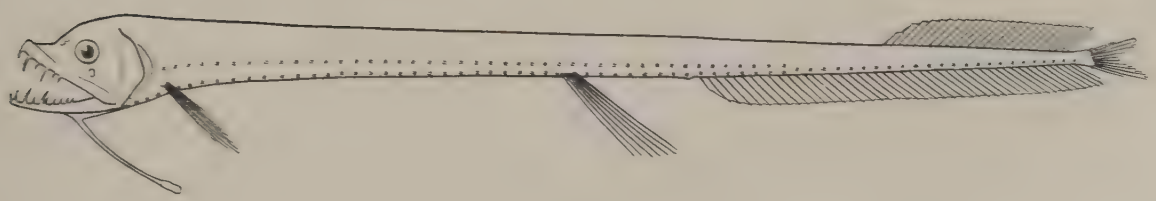

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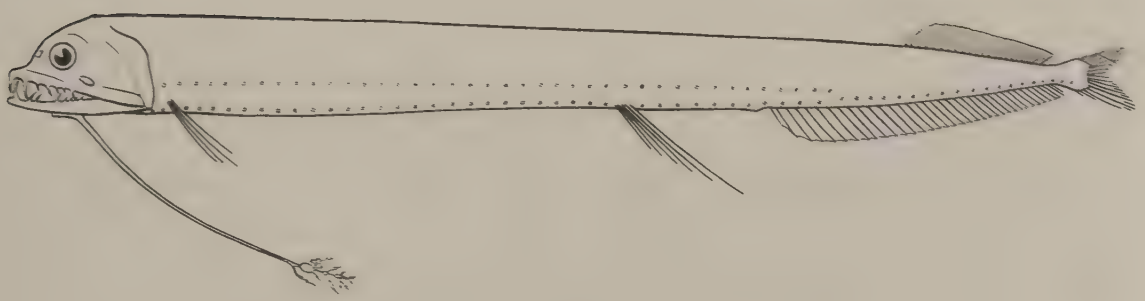

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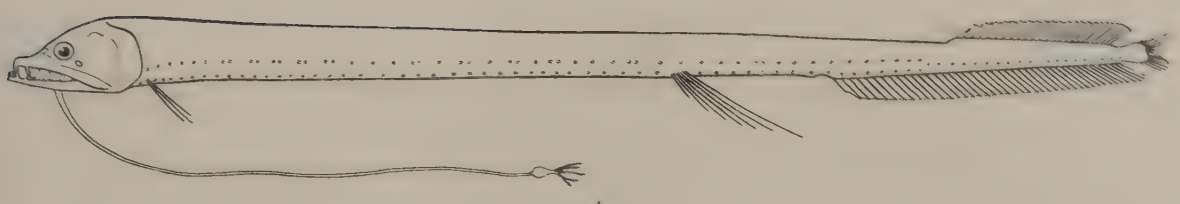

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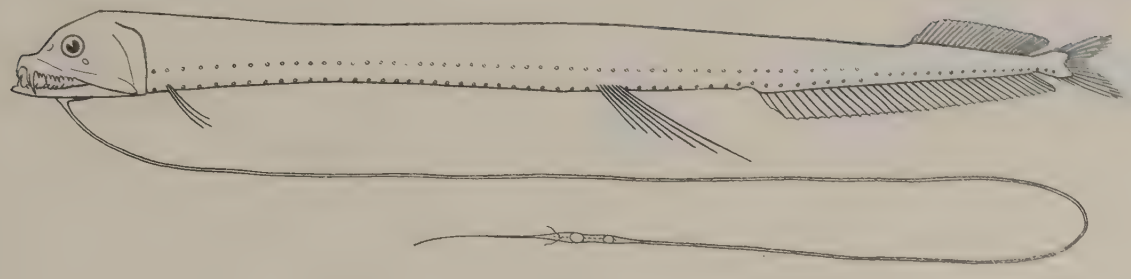
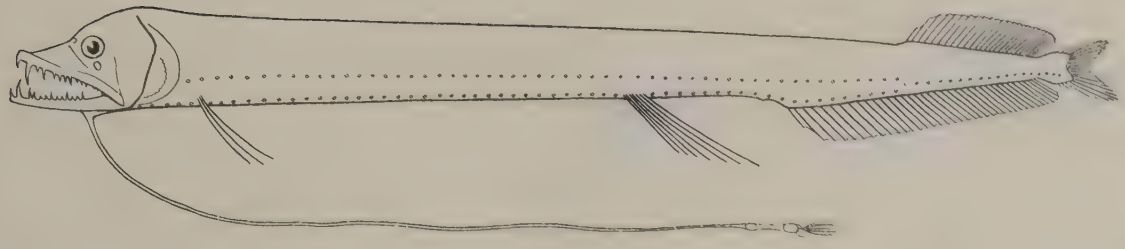
Fig. 1. *Eustomias stigmatopleura* ($\times 1^{1}/_{3}$).
Fig. 2. *Eustomias macrurus* ($\times 1^{1}/_{2}$).
Fig. 3. *Eustomias barbuva* ($\times 1^{1}/_{2}$).
Fig. 4. *Eustomias obscurus* ($\times {}^{4}/_{5}$).



1



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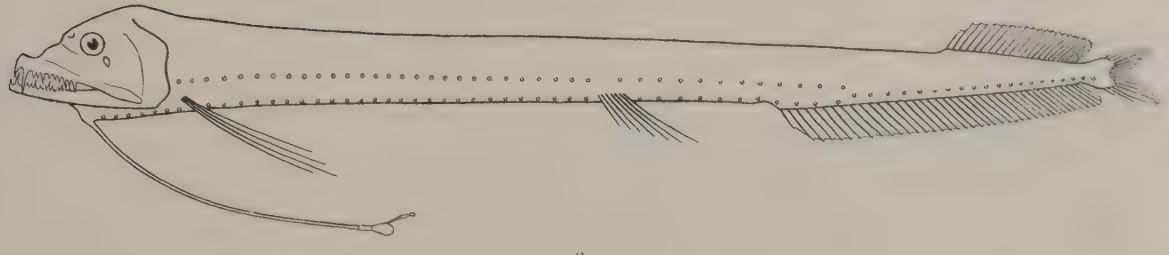

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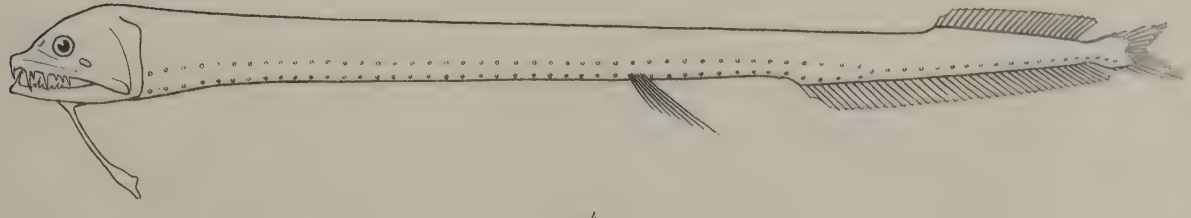
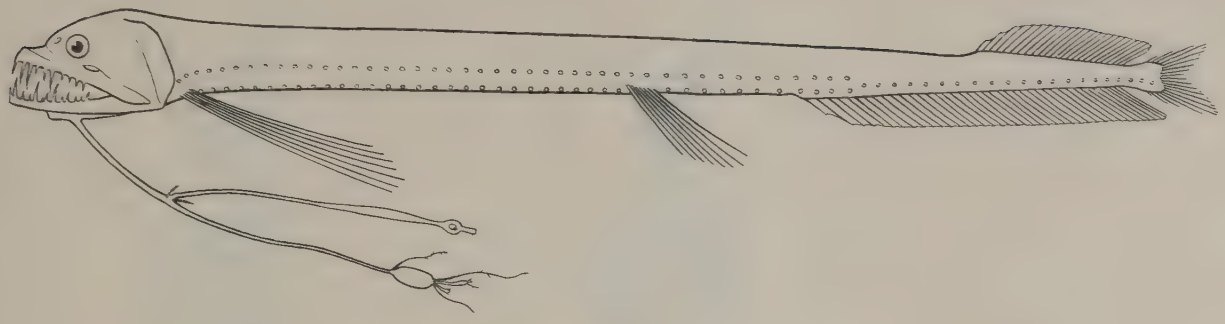


4

Fig. 1. *Eustomias bituberatus* (× 1 1/5).
Fig. 2. *Eustomias melanostigma* (× 1 1/2).
Fig. 3. *Eustomias parri* (× 1 3/4).
Fig. 4. *Eustomias dactylobolus* (× 2).



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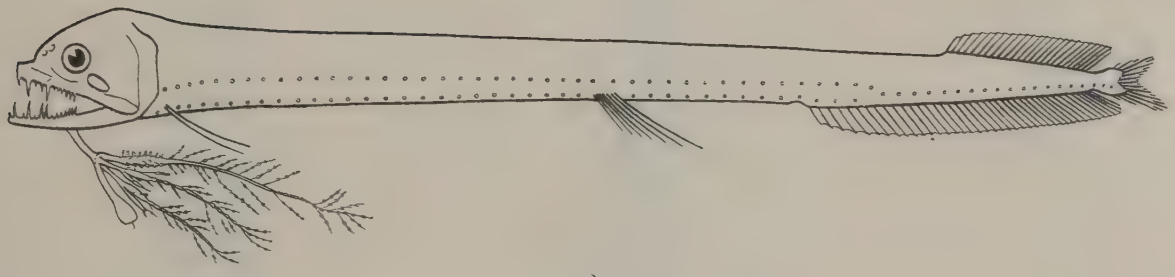

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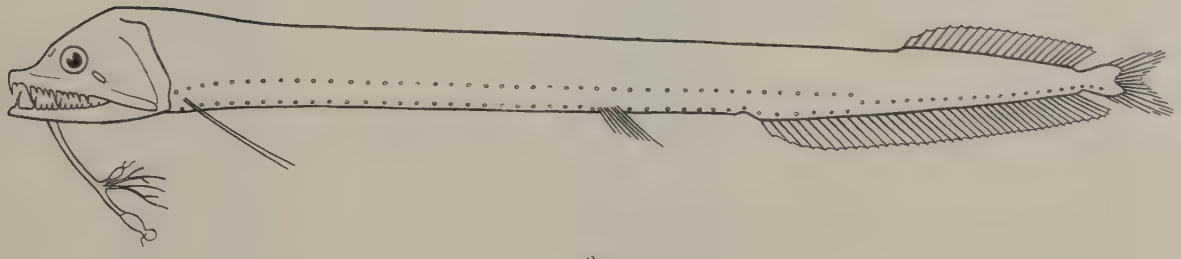

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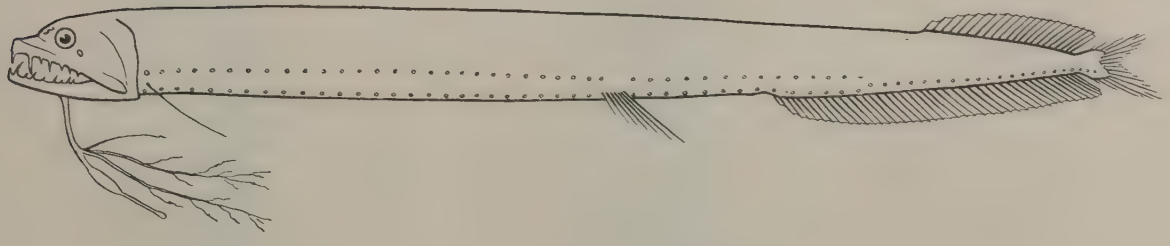


4

Fig. 1. *Eustomias tenisoni* (× 2). Fig. 2. *Eustomias silvescens* (× 1½). Fig. 3. *Eustomias schmidti* (× 2½). Fig. 4. *Eustomias monodactylus* (× 2).

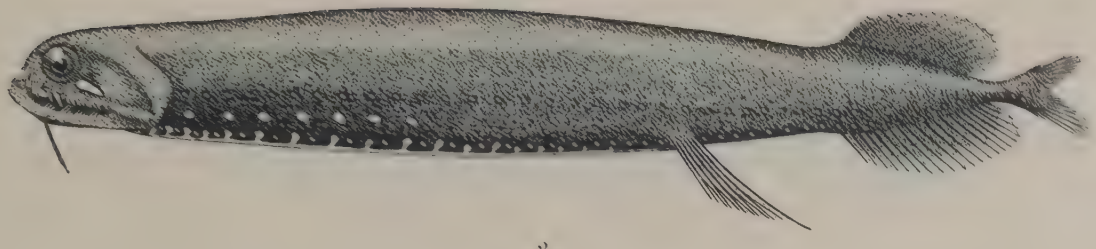
Fig. 1. *Melanolamna splendens*.

Fig. 2. *Melanostomias melanopogon* (Vaill.).

1 2

Fig. 1. *Haplostomias tentaculatus* (×2). Fig. 2. *Echiostoma barbatum* (×⅔).

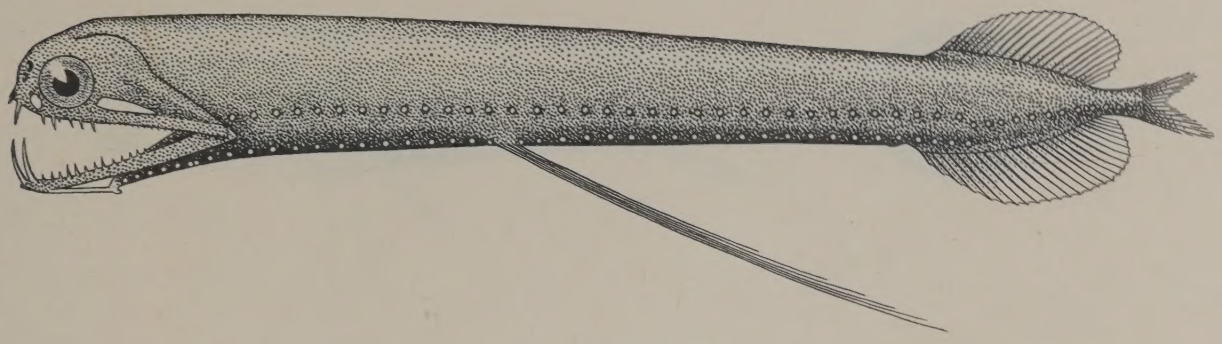
1



2

3

Fig. 1. *Photonectes braueri* (× 1⅓). Fig. 2. *Photonectes caerulescens* (× 1⅓).
Fig. 3. *Photonectes monodactylus* (× ⅔).



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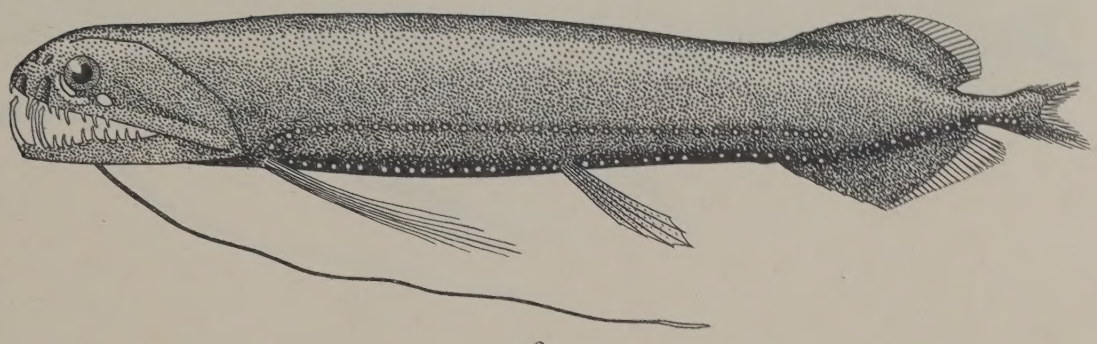

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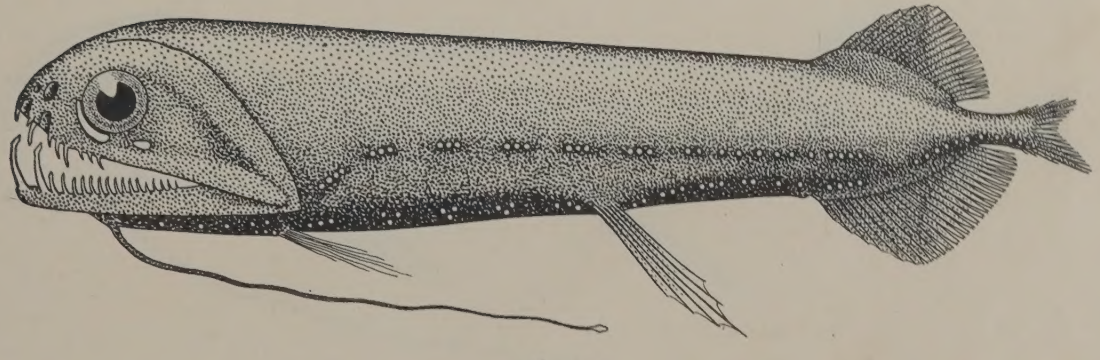
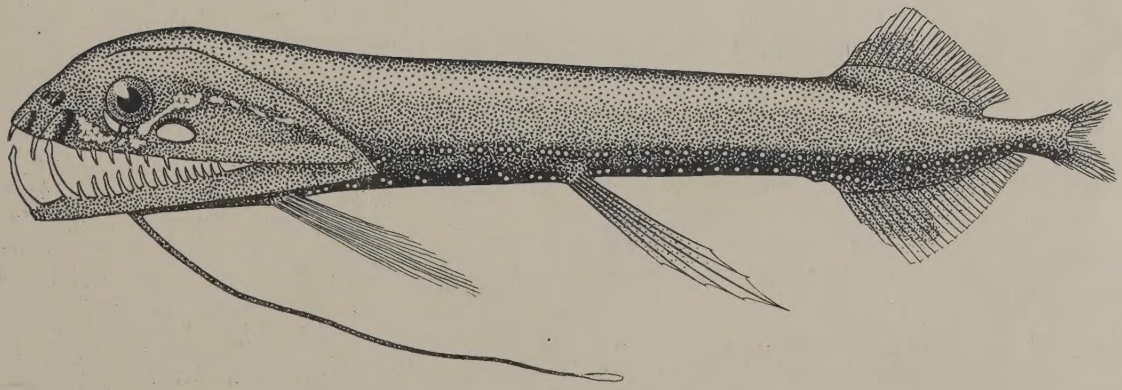


3

Fig. 1. *Photonectes guernei* (♂) (× 1 2/3). Fig. 2. *Aristostomias lunifer* (× 1 2/3).
Fig. 3. *Aristostomias xenostoma* (× 1 1/3).

1

2



3

Fig. 1. *Malacosteus danae.* Fig. 2. *Aristostomias grimaldii* ($\times 1^1/_3$).
Fig. 3. *Aristostomias polydactylus* ($\times 2^2/_3$).